

Welcome to NASA Applied Remote Sensing Training Program (ARSET) Webinar Series

Introduction to Remote Sensing Data for Land Management

**Course Dates: Every Tuesday, May 20-June 17
Time: 12-1PM EDT**

ARSET
Applied Remote SEnsing Training

A project of NASA Applied Sciences



Important Information

- Presentations URL:
 - [Http://arset.gsfc.nasa.gov/webinars](http://arset.gsfc.nasa.gov/webinars)
- Contact for requesting recorded link for the webinars:
 - Marines Martins: marines.martins@ssaihq.com
- Certificate of Completion
 - Attend all 5 webinars
 - Assignment 1 – download from training website or from the ARSET land webinar website
 - Assignment 2- after Week 4

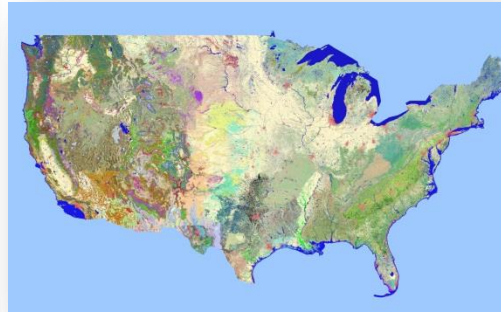
Course Outline

Week 1



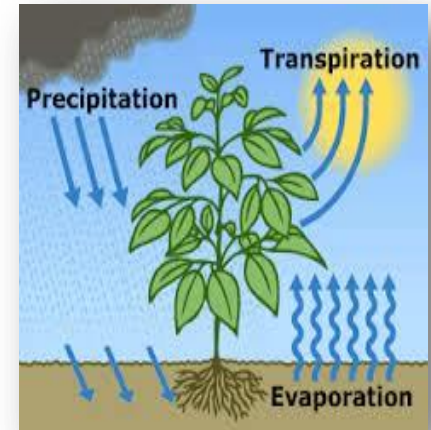
**Intro. & Background:
Satellite Remote Sensing**

Week 2



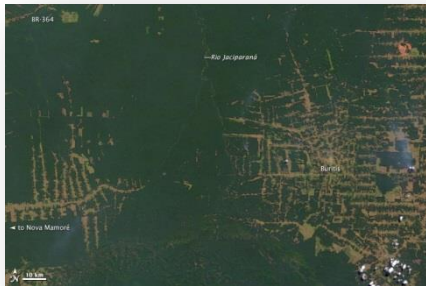
**Land Cover
Mapping/Web tools for
data access**

Week 3



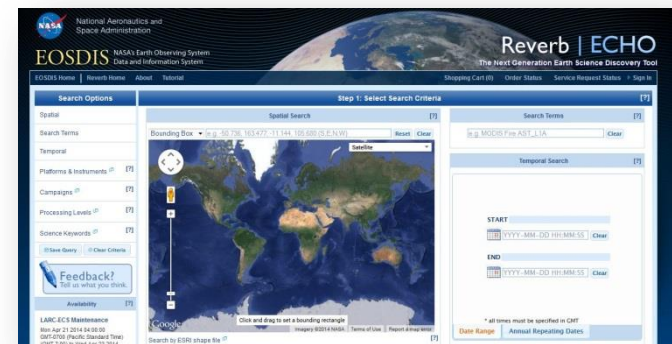
**Soil Moisture and
Evapotranspiration**

Week 4



Change Detection


Week 5



**Web tools for data access/Importing data
into GIS**

ARSET Land Resource Management

<http://arset.gsfc.nasa.gov/eco/webinars/land-management>

**ARSET**
Applied Remote Sensing Training

Earth Science Division

Applied Sciences
Program

ASP Water Resources

Search

ECO FORECASTING

HEALTH & AIR QUALITY

WATER RESOURCES

Eco Forecasting

▼ **Eco Webinars**

- Land Management


Eco Personnel

NASA Remote Sensing for Land Management

Tuesday, May 20, 2014 to Tuesday, June 17, 2014

Times: Every Tuesday at 12 pm EDT (4 pm UTC).

Course Objective: This course focuses on satellite image access and visualization. It does not cover the use of any image processing software for image analysis, which may be taught in future courses. This course is free.

Agenda:  **Land Management Webinar Agenda**

GIS: True

Instruments: **Landsat, MODIS**

Week 1

Overview of NASA Remote Sensing and Earth systems modeling data for Land Management/Natural Resource Management.

- Management/Natural Resource Management
- Course Introduction
- Fundamentals of Remote Sensing
- Examples of satellites, sensors for Natural Resource Management

Your Course Instructors for This Week

- Cindy Schmidt (ARSET):
cynthia.l.schmidt@nasa.gov
- Guest Speaker: Dr. Jennifer Dungan, NASA
Ames Research Center

General inquiries about ARSET: Ana Prados
(ARSET) aprados@umbc.edu

Outline

- **Brief review of last week**
- **Satellite Data Processing Levels**
- **Week 2: Land Cover Mapping and Web Tools for Data Access**
 - **Overview of satellites and sensors (Landsat, MODIS, VIIRS) for land management**
 - **Satellite data products for national and global land cover mapping**

Review of Week 1

Global Land Resources: Critical Issues

- Food production
 - Growing populations
 - Less natural resources
 - Changing climate
- Plant and animal species
 - Habitat loss
 - Declining biodiversity
 - Changing climate



Source: www.icid.org



Source: polarbearsinternational.org



Source: naturemappingfoundation.org

Land Management Issues

- Treeline/ecotone changes
- Invasive species
- Desertification
- Deforestation
- Urban growth
- Crop management
- Wildfire
- Loss of biodiversity
- Habitat loss



Source: nps.gov

Yellow star thistle



Source: NASA Earth Observatory

MODIS images of Rondonia in western Brazil.

NASA Satellite Instruments for Land Resources Management

Satellite	Sensor(s)	Spatial Resolution
Landsat 4 and 5	Landsat TM	30m (120 m thermal band)
Landsat 7	Landsat ETM+	15m panchromatic, 30m multispectral, 60m thermal
Landsat 8 (LDCM)	Operational Land Imager (OLI), Thermal Infrared Sensor (TIRS)	15m panchromatic; 30m multispectral; 100m thermal
Terra, Aqua	MODerate Resolution Imaging Spectroradiometer (MODIS)	250m - 8 km
Terra	ASTER	15-90m
EO-1	Hyperion, Advanced Land Imager (ALI)	10-30m
Suomi NPP	VIIRS	375-750m

Satellite Data Processing Levels

Levels of Data Processing and Spatial Resolution

- **Level 1 and Level 2** data products have the highest spatial and temporal resolution
- **Level 3 and 4 products** are derived products with equal or lower spatial and temporal resolution than Level 2 products. Available hourly, daily and for some products also monthly

Levels of Data Processing

Level 1 Products

Orbital data

Used to produce

Level 2 Products

Orbital data

Used to produce

Advanced
Webinar/Hands-on
Training)

Level 3 Products

composites
of level 2 products

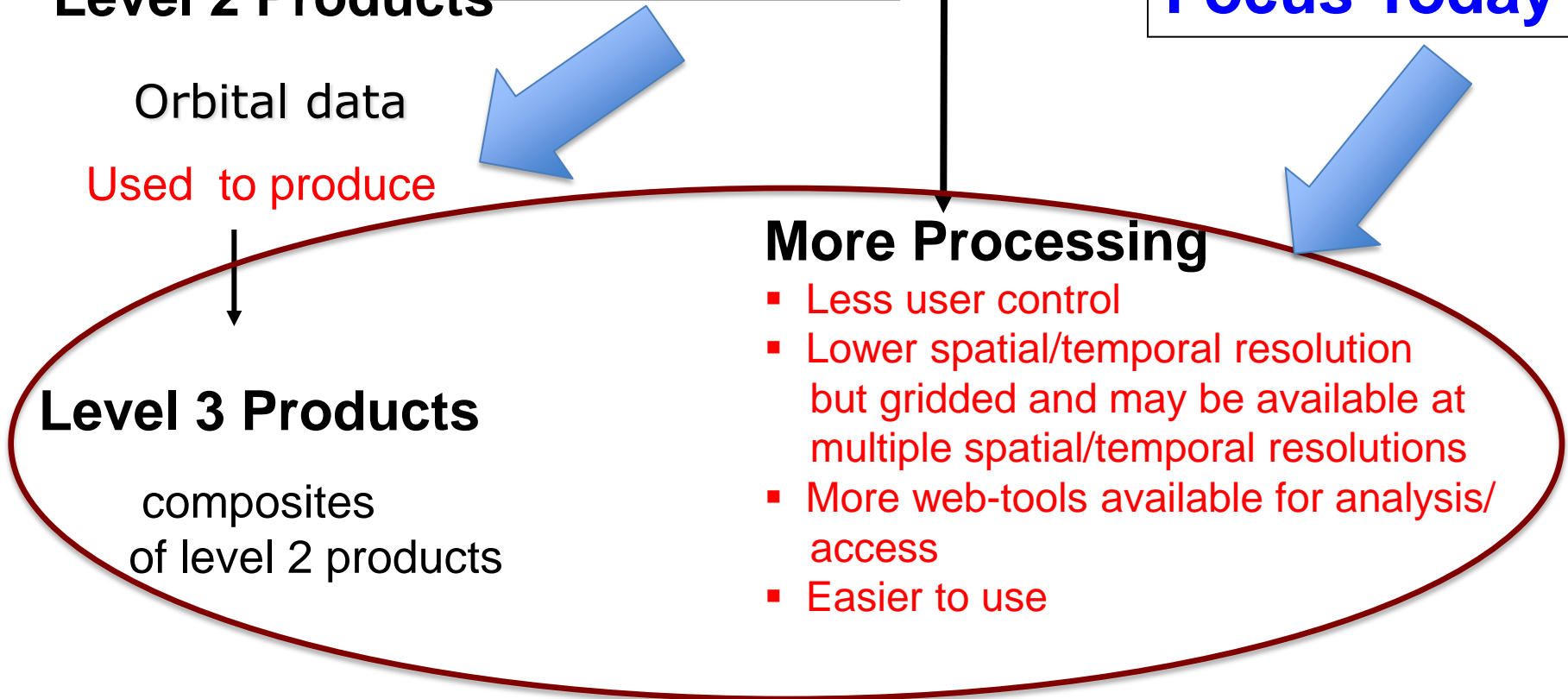
Less Processing

- More user control
- Highest spatial/temporal resolution
- Harder to use

Focus Today

More Processing

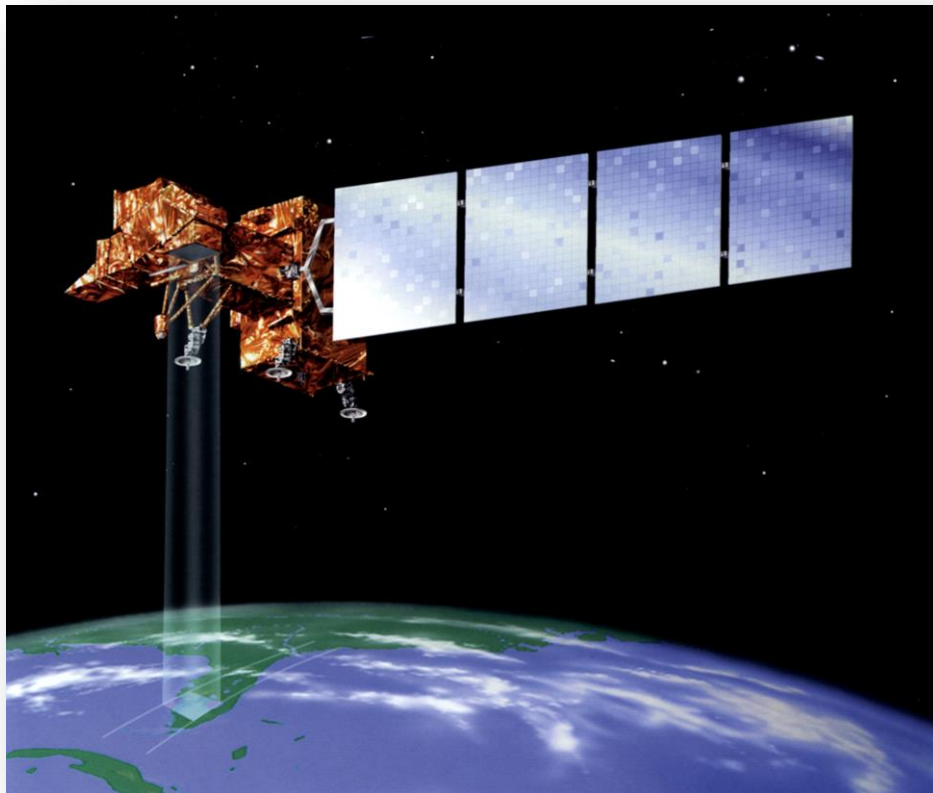
- Less user control
- Lower spatial/temporal resolution but gridded and may be available at multiple spatial/temporal resolutions
- More web-tools available for analysis/access
- Easier to use



Land Resources Satellites and Sensors

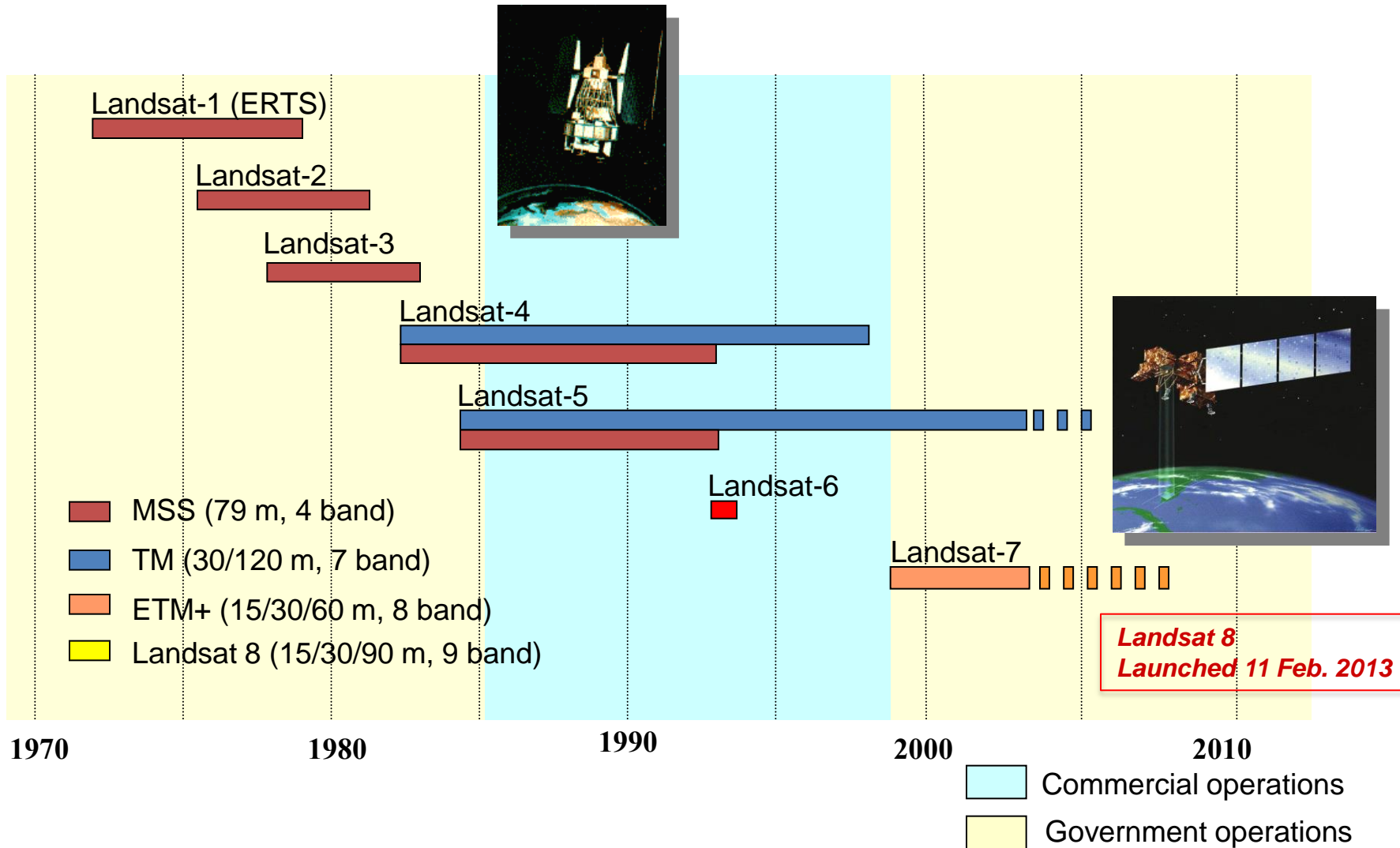
- **Landsat**
 - Brief Overview (History and Current Missions)
 - Characteristics of Landsat Data
 - Where to Obtain Landsat Images
 - Landsat Derived Landcover Products (national and global)
 - Where to obtain landcover products
- **MODIS Land Products Overview**
 - Brief overview
 - Characteristics of MODIS data
 - MODIS Land Products and Applications (national and global)
 - Where to Obtain MODIS Products
- **VIIRS**
 - Brief overview and status of Suomi NPP mission
 - VIIRS products

LANDSAT

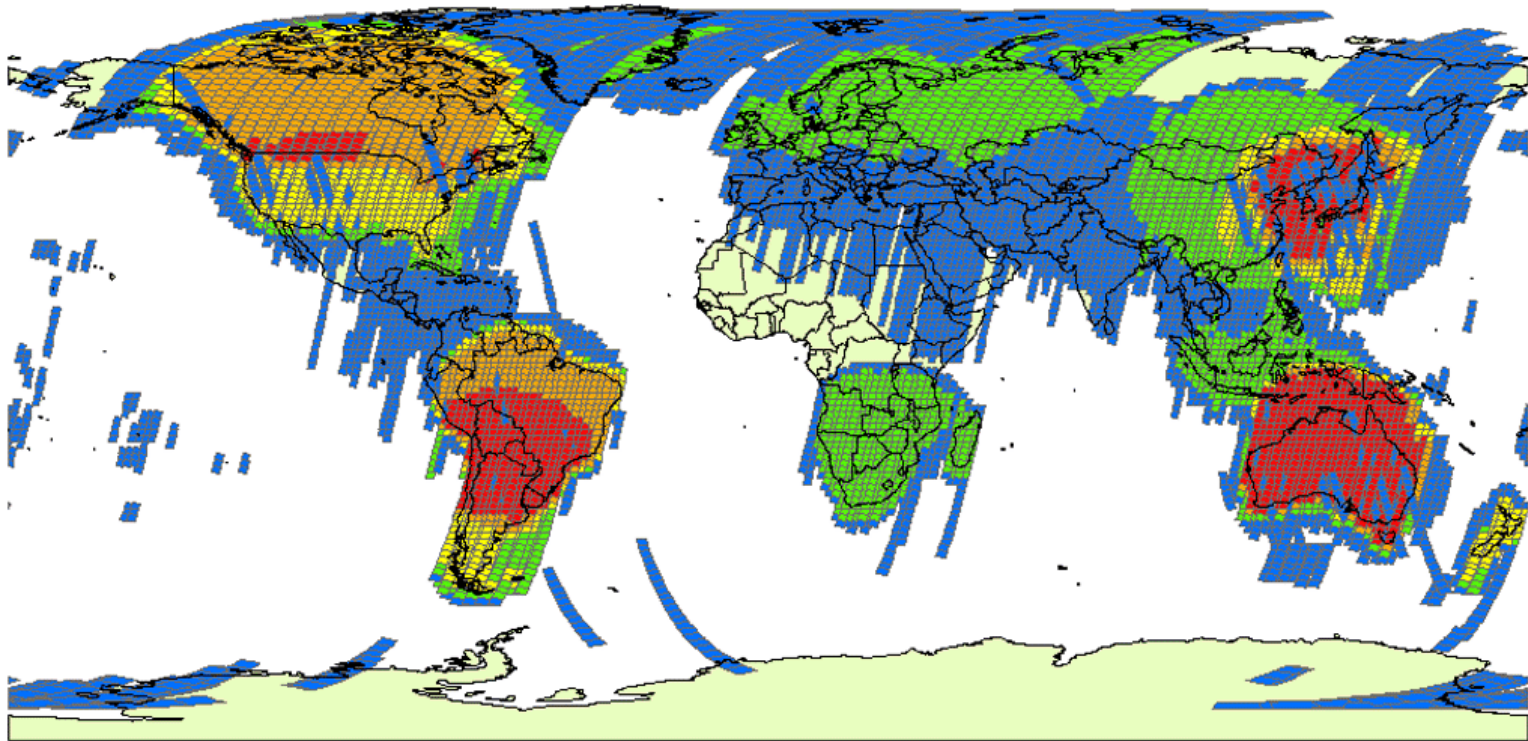


Source: landsat.gsfc.nasa.gov

Landsat – 30 Years of Earth Observations



Landsat Global Archive Consolidation (USGS)



LGAC WRS2 Scenes

Status as of March 31, 2014

Acquisition Date Range: August 22, 1982 through March 30, 2014

2,997,011 Cumulative Scenes Delivered

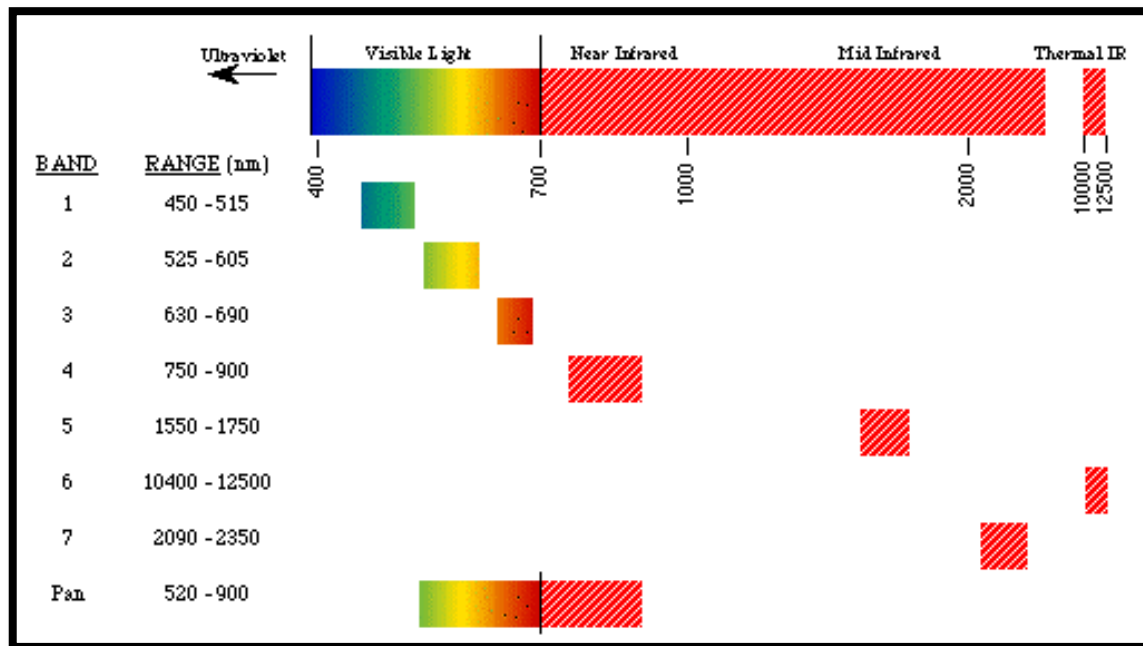
2,832,215 Total WRS2 Scenes Acquired

12,945 Unique WRS2 Path/Rows

1 - 83 84 - 238 239 - 471 472 - 757 758 - 1083

Characteristics of Landsat: Spectral

- Landsat instruments measure primarily light that is reflected from Earth's surface (with one exception)
- Landsat instruments are designed to detect visible and infrared (near and mid) wavelengths.



Landsat bands of
ETM+ (Landsat 7)

Characteristics of Landsat 4, 5 and 7

Bands	Wavelength (micrometers)	Resolution (m) Landsat 4-5 (TM)	Resolution (m) Landsat 7 (ETM+)
Band 1-Blue	0.45-0.52	30	30
Band 2 Green	0.52-0.60	30	30
Band 3- Red	0.63-0.69	30	30
Band 4-Near Infrared	0.76-0.90	30	30
Band 5- Shortwave Infrared 1	1.55-1.75	30	30
Band 6- Thermal Infrared	10.40-12.50	120	60
Band 7- Shortwave Infrared 2	2.08-2.35	30	30
Band 8-Pan	0.52-0.90	--	15

Characteristics of Landsat 8

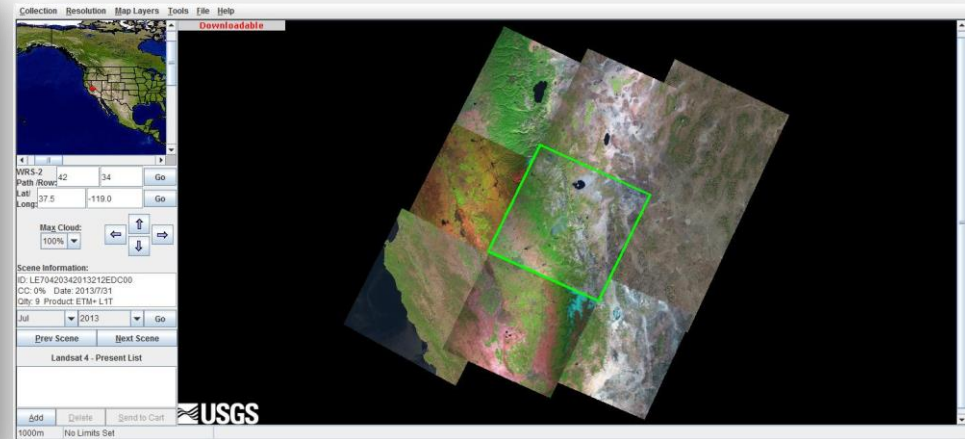
Bands	Wavelength (micrometers)	Spatial Resolution (meters)
Band 1-Coastal aerosol	0.43-0.45	30
Band 2- Blue	0.45-0.51	30
Band 3- Green	0.53-0.59	30
Band 4- Red	0.64-0.67	30
Band 5- Near Infrared	0.85-0.88	30
Band 6- SWIR 1	1.57-1.65	30
Band 7- SWIR 2	2.11-2.29	30
Band 8-Panchromatic	0.50-0.68	15
Band 9-Cirrus	1.36-1.38	30
Band 10- Thermal Infrared 1	10.60-11.19	100
Band 11- Thermal Infrared 2	11.50-12.51	100

Where to Obtain Landsat Images

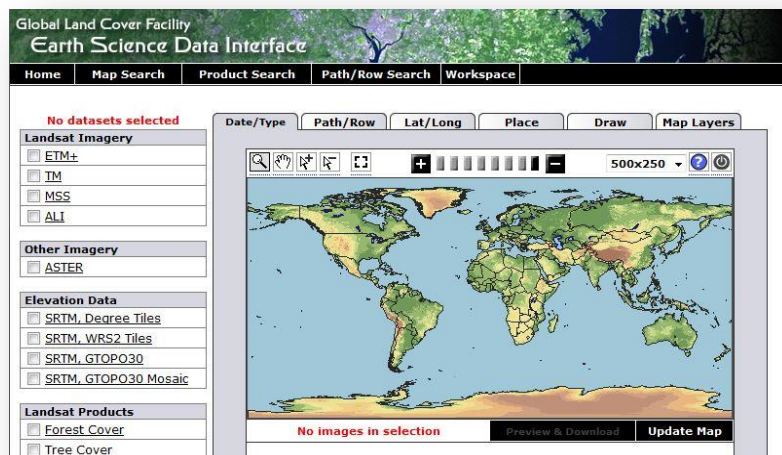
The LandsatLook Viewer



GloVis



Global Land Cover Facility

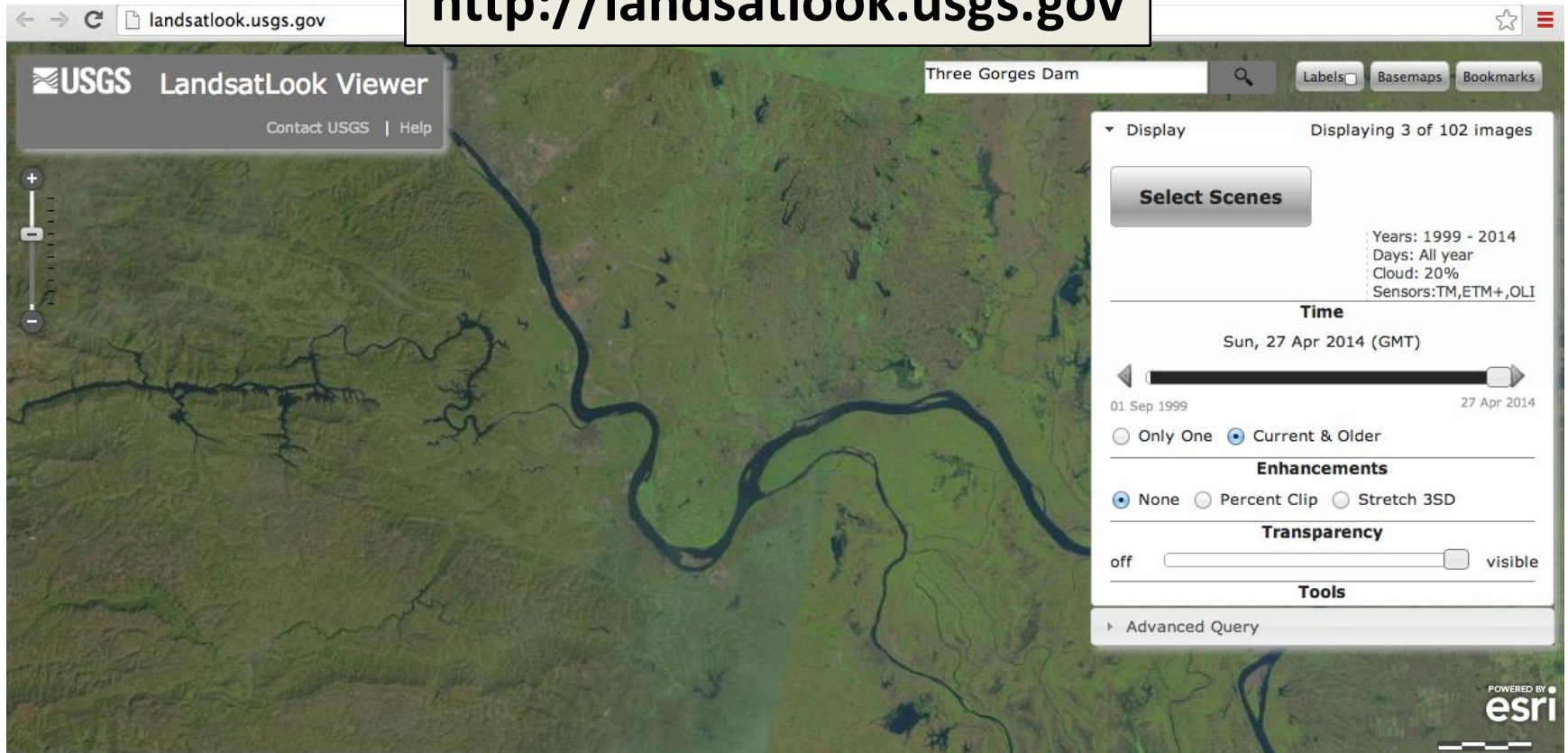


Earth Explorer



Acquiring Landsat Images

<http://landsatlook.usgs.gov>



The LandsatLook Viewer

- Access to all full resolution natural color Landsat imagery and Level 1 Data products

Acquiring Landsat Images

<http://glovis.usgs.gov>

The screenshot displays the USGS Global Visualization Viewer (GloVis) interface. At the top, the USGS logo and tagline "science for a changing world" are visible, along with the text "Earth Resources Observation and Science Center (EROS)". A navigation bar includes links for "USGS Home", "Contact USGS", and "Search USGS". Below the header, a "System Notices (3), 2 New, 3 Critical" alert is shown. The main interface features a "Collection" dropdown menu, a "Resolution" dropdown, and a "Map Layers" section. A "Tools" menu is also present. The central area shows a satellite image of a landscape with a yellow rectangular bounding box highlighting a specific region. On the left side, there are input fields for "WRS-2 Path / Row" (169 / 51) and "Lat / Long" (13.0 / 38.6), each with a "Go" button. Below these, a "Max Cloud" slider is set to 100%. The "Scene Information" section displays details for a specific scene: ID: LC81690512014089LGN00, CC: 0%, Date: 2014/3/30, Qlty: 9, Product: OLI_TIRS_L1T. At the bottom, there are buttons for "Prev Scene" and "Next Scene", and a link to the "Landsat 8 OLI Scene List".

- **GloVis** is a quick and easy online search and download tool for satellite data
- Available USGS data products: Landsat Archive, Landsat Global Land Survey (GLS)

Acquiring Landsat Images

<http://earthexplorer.usgs.gov>



[USGS Home](#)
[Contact USGS](#)
[Search USGS](#)

EarthExplorer

Page Expires In 1:45:16

[Home](#) [3 New System Messages](#)

[Login](#) [Register](#) [RSS](#) [Feedback](#) [Help](#)

[Search Criteria](#) [Data Sets](#) [Additional Criteria](#) [Results](#)

1. Enter Search Criteria

To narrow your search area: type in an address or place name, enter coordinates or click the map to define your search area (for advanced map tools, view the [help documentation](#)), and/or choose a date range.

[Address/Place](#) [Path/Row](#) [Feature](#) [Circle](#)

Show

Clear

[Coordinates](#) [Predefined Area](#) [Shapefile](#) [KML](#)

[Degree/Minute/Second](#) [Decimal](#)

No coordinates selected.

Use Map

Add Coordinate

Clear Coordinates

[Date Range](#) [Result Options](#)

Search Criteria Summary (Show)

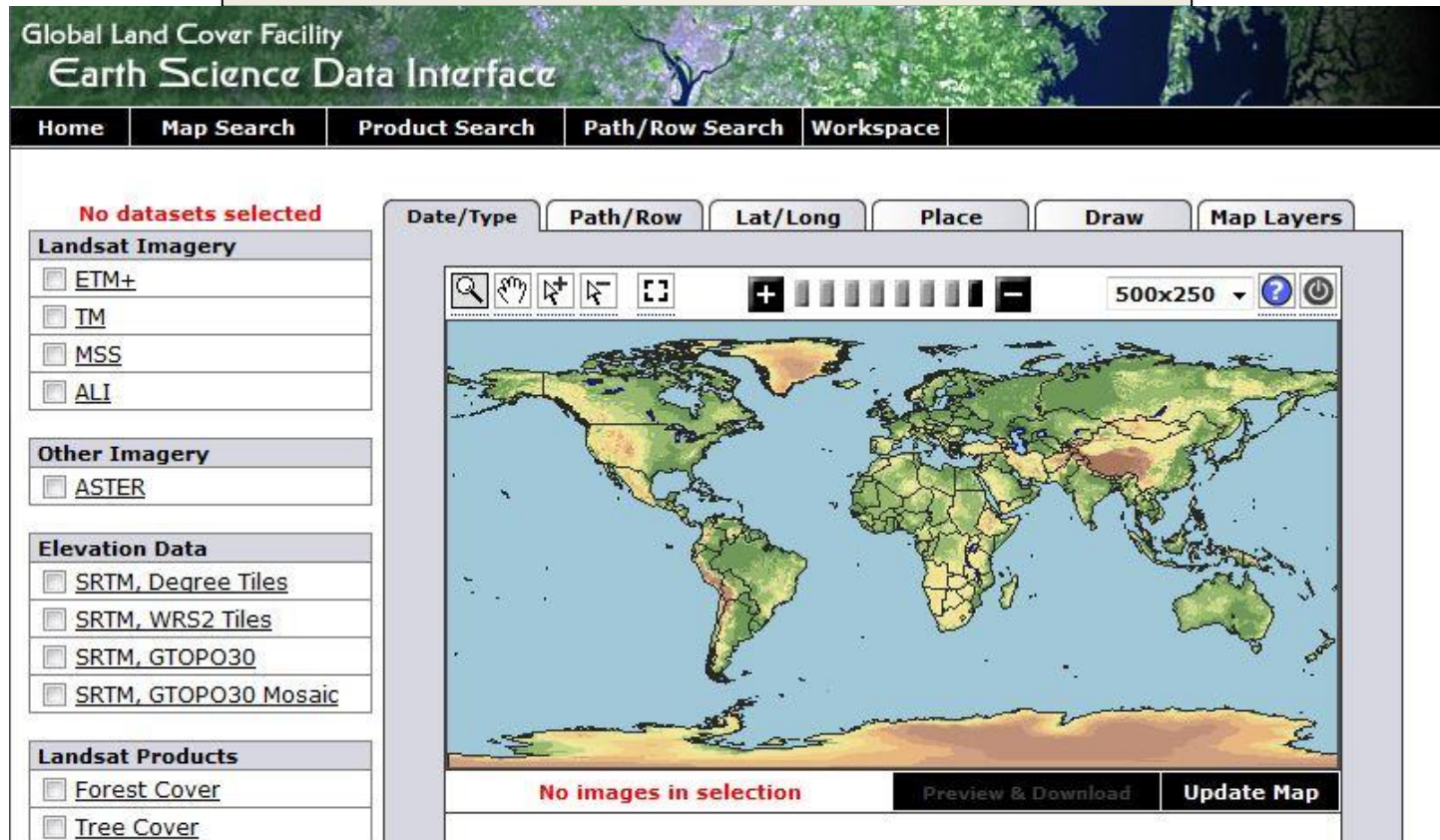
[Clear Criteria](#)



Acquiring Landsat Images

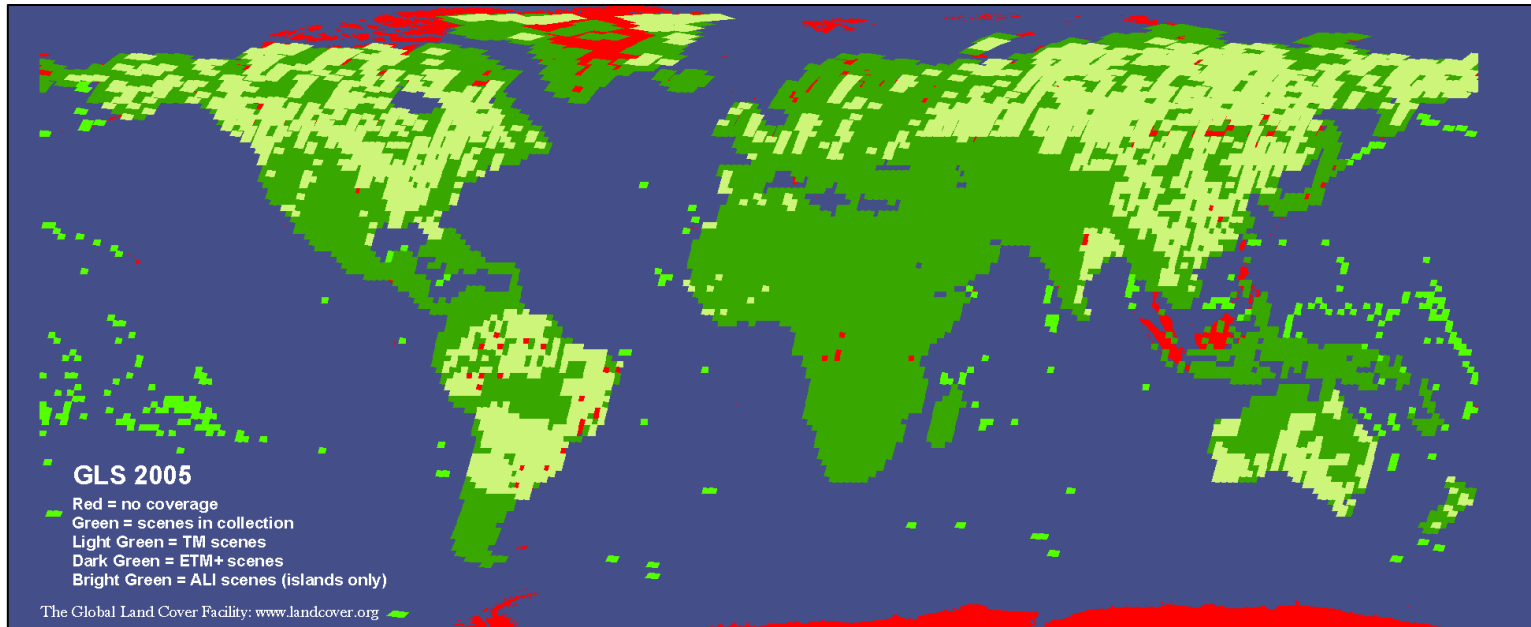
Global Land Cover Facility (GLCF)

<http://glcf.umd.edu/data/landsat/>



- GLCF developed by the University of Maryland
- Landsat products delivered in GeoTIFF format, UTM, WGS84
- Product Guides, Data Download Guides, and Technical Guides available

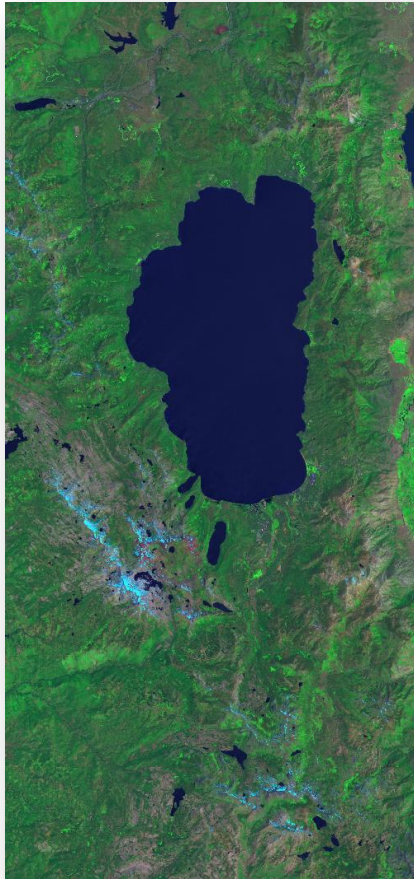
Global Land Survey (GLS)



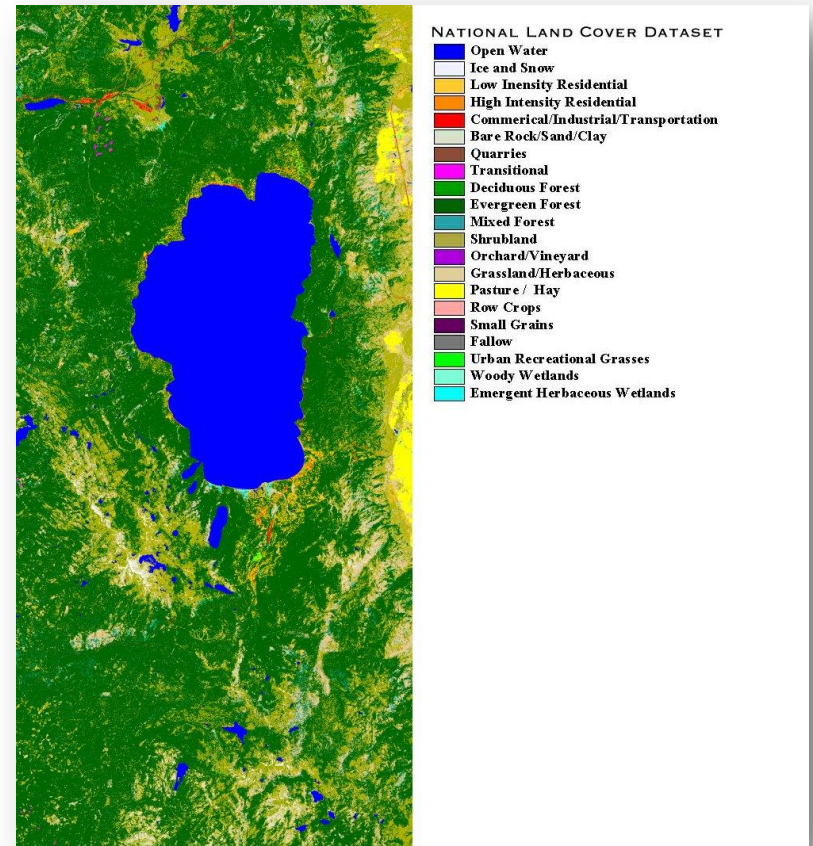
source: glcf.umd.edu

- Collaboration between USGS and NASA
- Global land survey datasets (uses a global collection of cloud free Landsat images from 1978-2008)
- Each GLS collection was created from the primary sensor in use at the the time
- Time series include (GLS 1975, GLS 1990, GLS 2000, GLS 2005, GLS 2010)
- **Acquire GLS datasets through USGS earthexplorer, GloVis, and GLCF**

Turning Data into Information: Land Cover Maps



Landsat Image of Lake Tahoe



Landcover map of Lake Tahoe

Landsat Derived Land Cover Products

- **United States**

- National Land Cover Database (NLCD)
- GAP Analysis
- LANDFIRE

- **Global**

- Global Land Cover Network (FAO)
- Forest Change Products (Amazon Basin, Central Africa, Paraguay) and Landsat Tree Cover (GLCF)

National Land Cover Database (NLCD)



- Supported by the Multi-Resolution Land Characteristic Consortium (MLRC)
- Provides National Land Cover Mapping products at 30m resolution for 1992, 2001, 2006 and 2011.
- 16 class Land Cover classification scheme of the entire U.S. (modified from The Anderson Level 2 Classification System)
- Other NLCD Mapping products include: Land Cover Change, Percent Tree Canopy, and Percent Developed Imperviousness (1992, 2001, 2006)

National Land Cover Database (USGS)

http://www.mrlc.gov/nlcd11_data.php

National Land Cover Database (NLCD)

Home Find Data Resources FAQ About Us Contact Us

NLCD 2011

- Product Description
- Data Downloads**
- Legend
- References

NLCD 2006

- Product Description
- Data Downloads
- Legend
- Statistics
- References

NLCD 2001

- Product Description
- Data Downloads
- Legend
- Statistics
- References

Retrofit Land Cover Change

- Product Description
- Data Downloads
- Legend
- References

NLCD 1992


- Product Description
- Data Downloads
- Legend
- Statistics
- References

National Land Cover Database 2011 (NLCD2011)


Product Data Downloads

NOTE: NLCD 2001 (2011 Edition) and NLCD 2006 (2011 Edition) products must be used in any comparison of NLCD 2001, NLCD 2006 and NLCD 2011 data products.


Conterminous United States




[NLCD 2011 Land Cover](#) (1.1Gb)
The 2011 land cover layer for the conterminous United States for all pixels.




[NLCD 2006/2011 Land Cover Change](#) (128MB)
Land cover layer containing only those pixels identified as changed between NLCD 2006 Land Cover 2011 Edition and NLCD2011 Land Cover products across the conterminous United States.



[NLCD 2011 Percent Tree Canopy](#) (13.6 GB)
The 2011 percent tree canopy layer for the conterminous United States for all pixels. (Data Set Credit: USDA Forest Service Remote Sensing Applications Center).



[NLCD 2011 Percent Developed Imperviousness](#) (741MB)
The 2011 percent developed imperviousness layer for the conterminous United States for all pixels.



[NLCD 2006/2011 Percent Developed Imperviousness Change](#) (66MB)
Contains the difference in percent developed imperviousness pixels that changed between NLCD 2006 percent developed imperviousness (2011 Edition), and NLCD 2011 percent developed imperviousness.

NLCD2011 just released!

National GAP Analysis Program (USGS)

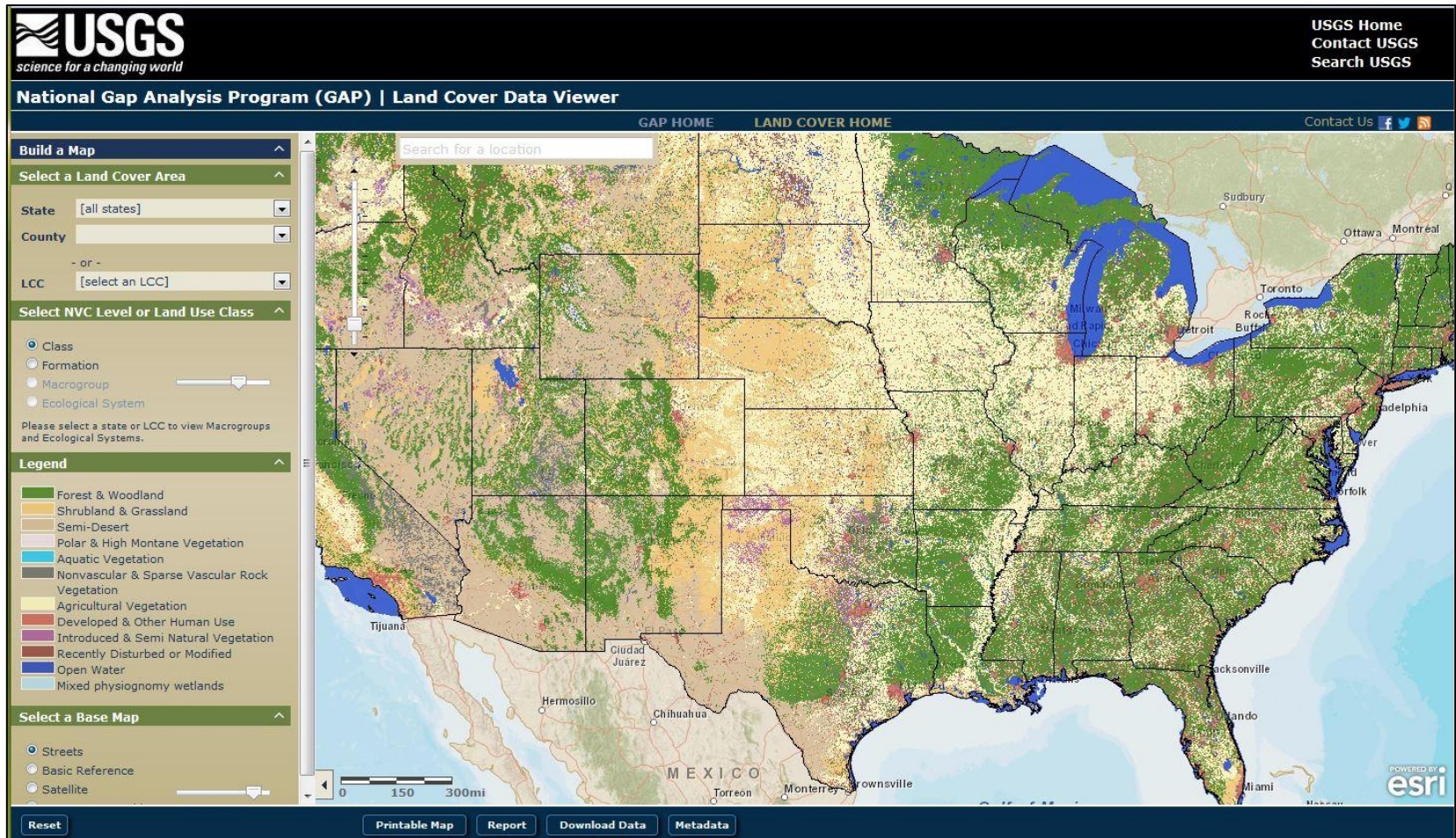


Products:

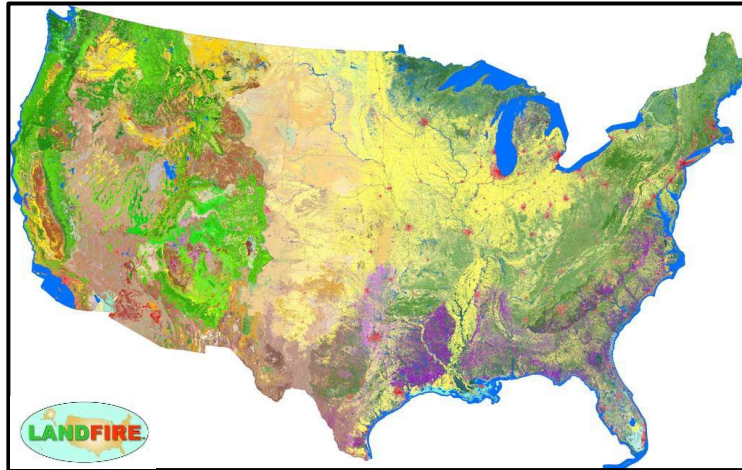
- Land Cover Maps showing dominant vegetation types (for ConUS, Alaska, Hawaii and Puerto Rico) using Landsat imagery from 1999-2001
 - Focused on habitat identification
 - Uses ecological systems classification system produced by NatureServe
 - IMG and ESRI GRID file formats
- Species Distribution Maps can predict the distribution of each vertebrate species.
 - ESRI GRID and DBF formats
- Land Stewardship/Protected Areas data indicate categories of ownership, management authority, and management status for biodiversity conservation.

National Gap Analysis Program

<http://gapanalysis.usgs.gov>



LANDFIRE



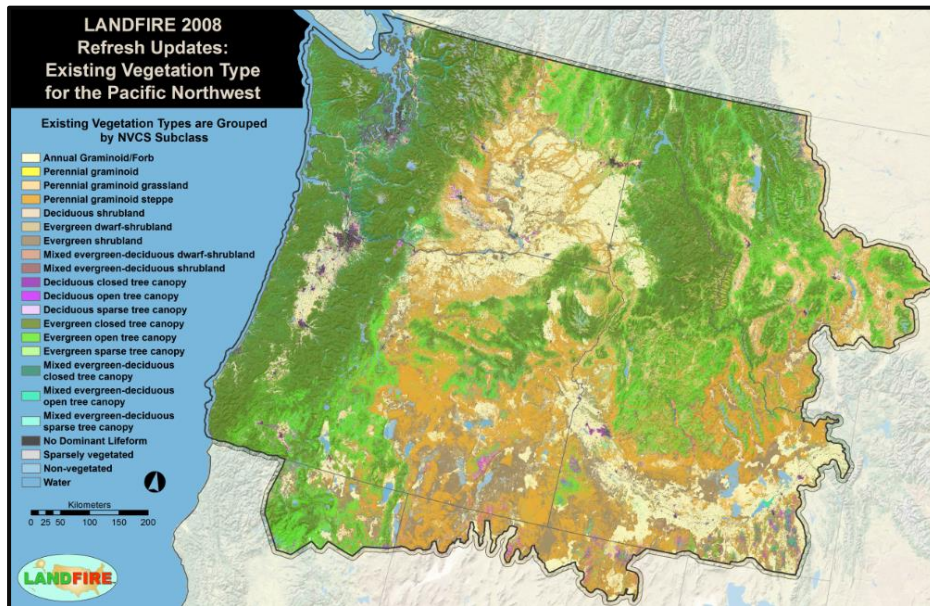
(Interagency Partnership USFS & USGS)

Products: Delivered at 30 m spatial resolution

- Vegetation data layers using Landsat imagery from 1999 - present
 - Current and historic vegetation composition and structure of the entire U.S.
 - Uses ecological systems classification system produced by NatureServe
 - IMG and ArcGRID file formats
- Fuel and Fire Regime data layers
 - Fire Behavior and fuel loading models for entire U.S. 1999 -present
 - ArcGRID and DBF formats
- Disturbance data
 - Fuel, vegetation, natural, and prescribed disturbance by type and year 1999-present
 - ArcGRID formats

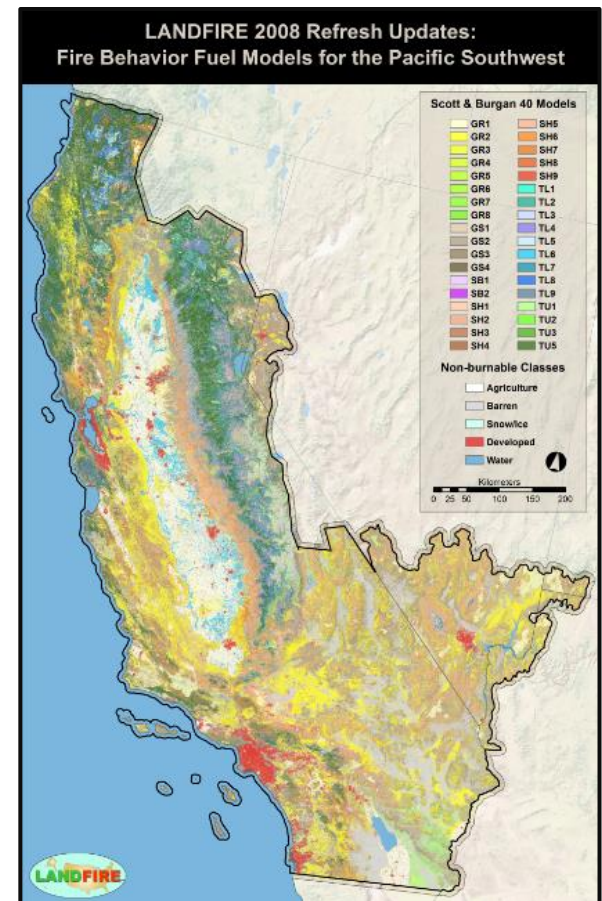
LANDFIRE Data Product Examples

Existing Vegetation Type (EVT)

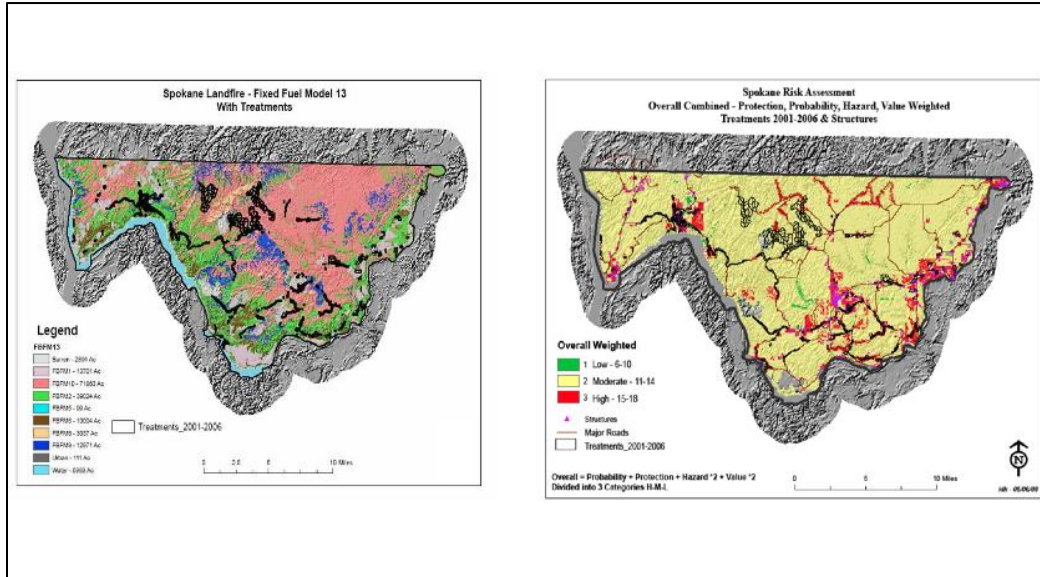


LANDFIRE Vegetation products are used in many different applications, such as, change detection analysis, identifying the nation's major ecosystems, for natural resource management, and to inventory wildlife habitat.

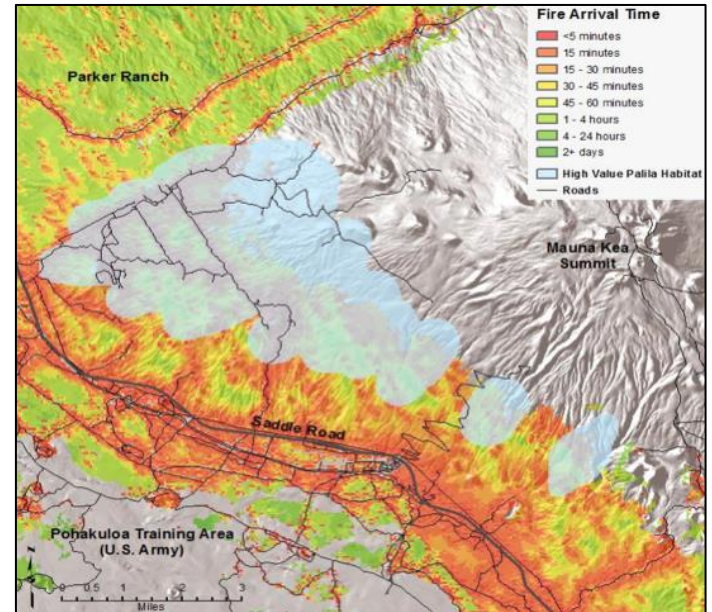
40 Scott and Burgan Fire Behavior Fuel Models (FBFM13)



Examples of LANDFIRE data products being used across the country



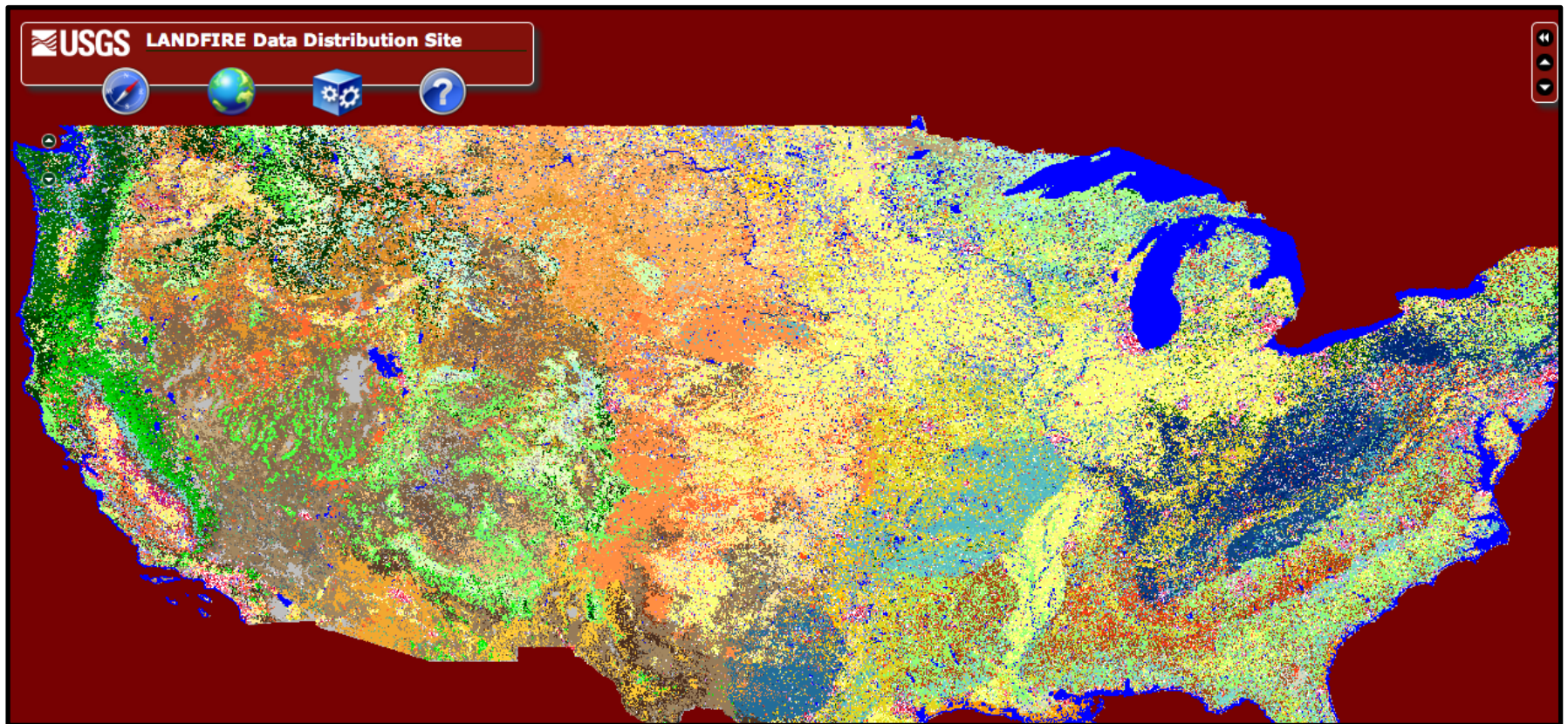
Use of LANDFIRE Data in Wildland Fire Risk Assessment and Fuels Program Planning for Bureau of Indian Affairs, Spokane Agency, Spokane Tribe.



Wildland Fire Management Plan and Critical Risk Analysis for the Hawaiian Volcano, Mauna Kea.

The LANDFIRE Program

<http://www.landfire.gov>



FAO Global Land Cover-SHARE (GLC-SHARE)

Food and Agriculture Organization of the United Nations (FAO)

http://www.glcn.org/databases/lc_glcshare_en.jsp

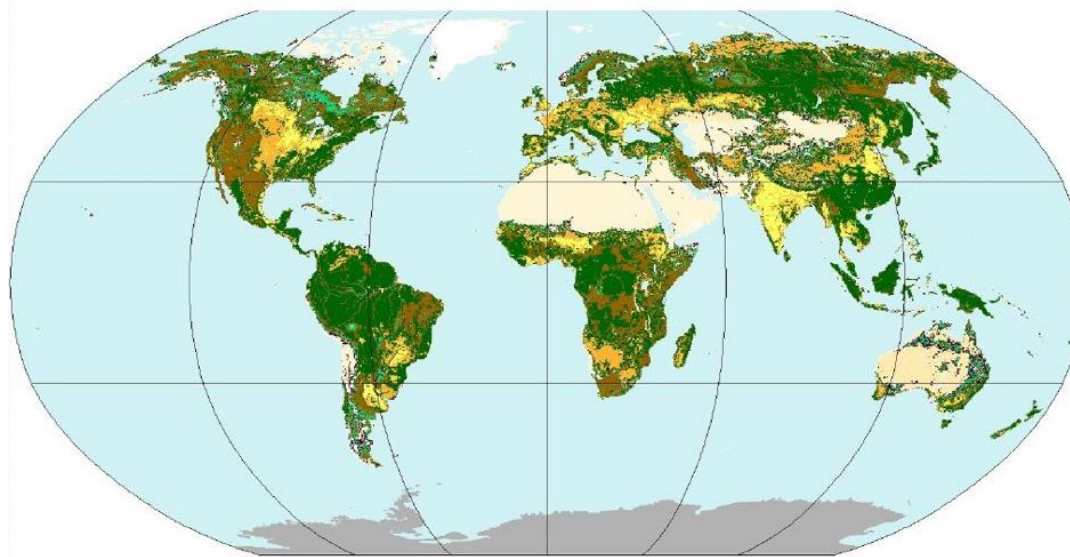


Figure 3 – Distribution of dominant GLC-SHARE Land Cover Database.



- GLC-SHARE combines “best available” high resolution national, regional and/or subnational land cover databases
- Produced with a resolution of 30 arc-second (~ 1 sq. km.)
- 11 land cover classes
- Beta-release 1.0

Landsat Tree Cover

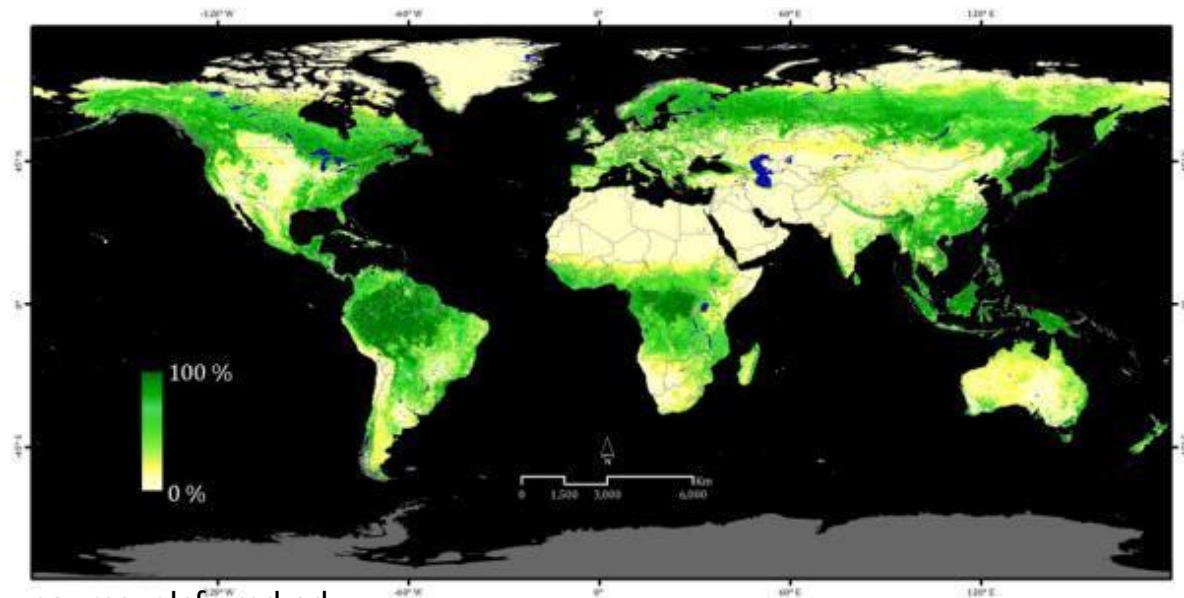
Global Land Cover Facility

www.landcover.org

Landsat Tree Cover

Global Land Cover Facility (GLCF)

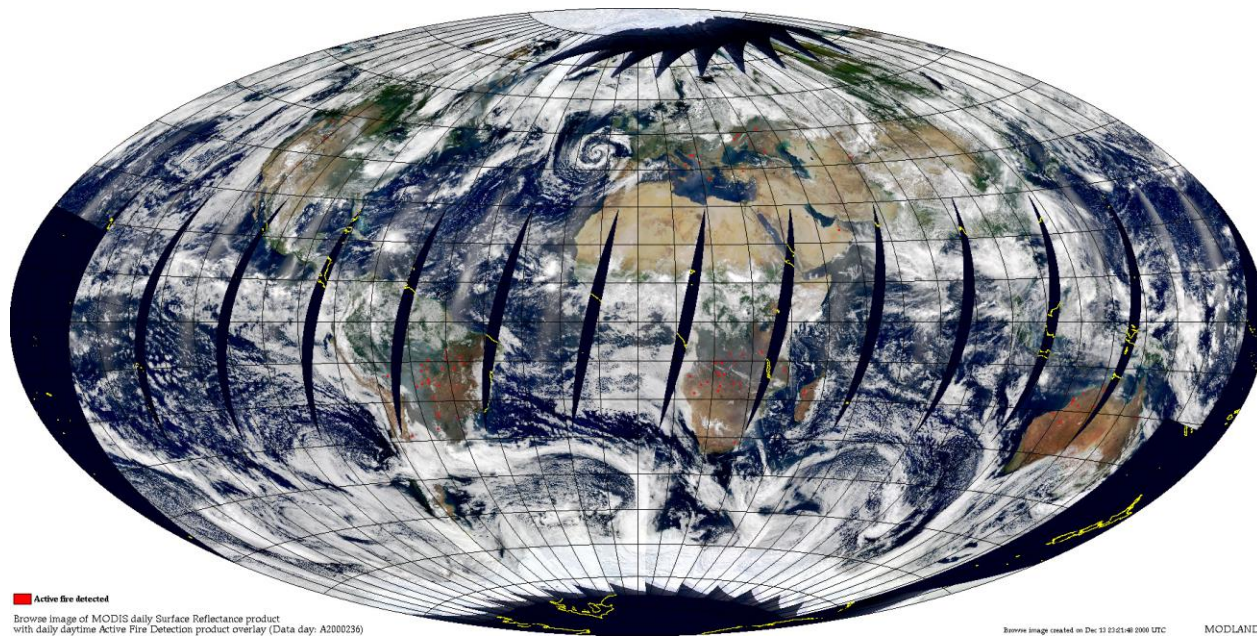
<http://glcf.umd.edu/data/landsatTreecover/>



source: glcf.umd.edu

- Landsat Tree Cover layers estimate the percent of tree cover per 30m pixel area (includes stems, branches, leaves greater than 5 meters in height)
- Derived from all seven bands of Landsat 5-TM and Landsat ETM
- Landsat Tree Cover product represents 2000, 2005

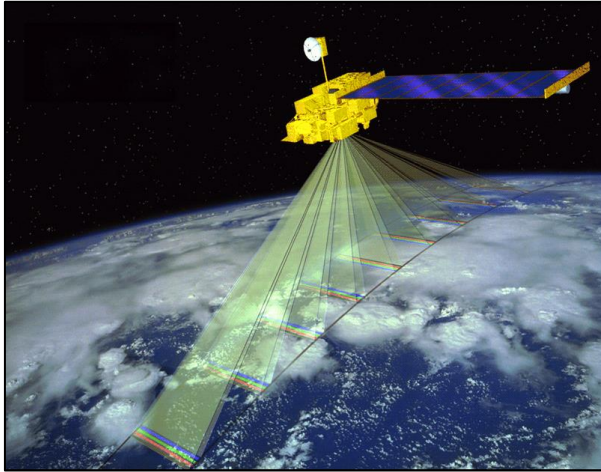
MODIS



Source: earthobservatory.nasa.gov

MODIS

The Moderate Resolution Imaging Spectroradiometer



Spatial Resolution

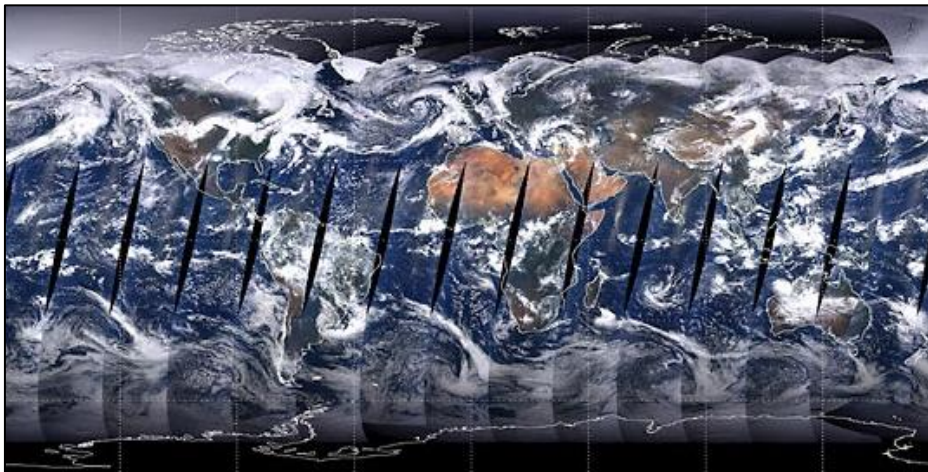
250m, 500m, 1km

Temporal Resolution

Daily, 8-day, 16-day, monthly, quarterly, yearly
(2000-present)

Data Format

Hierarchical Data Format - Earth Observing System
Format (HDF-EOS)



Spectral Coverage

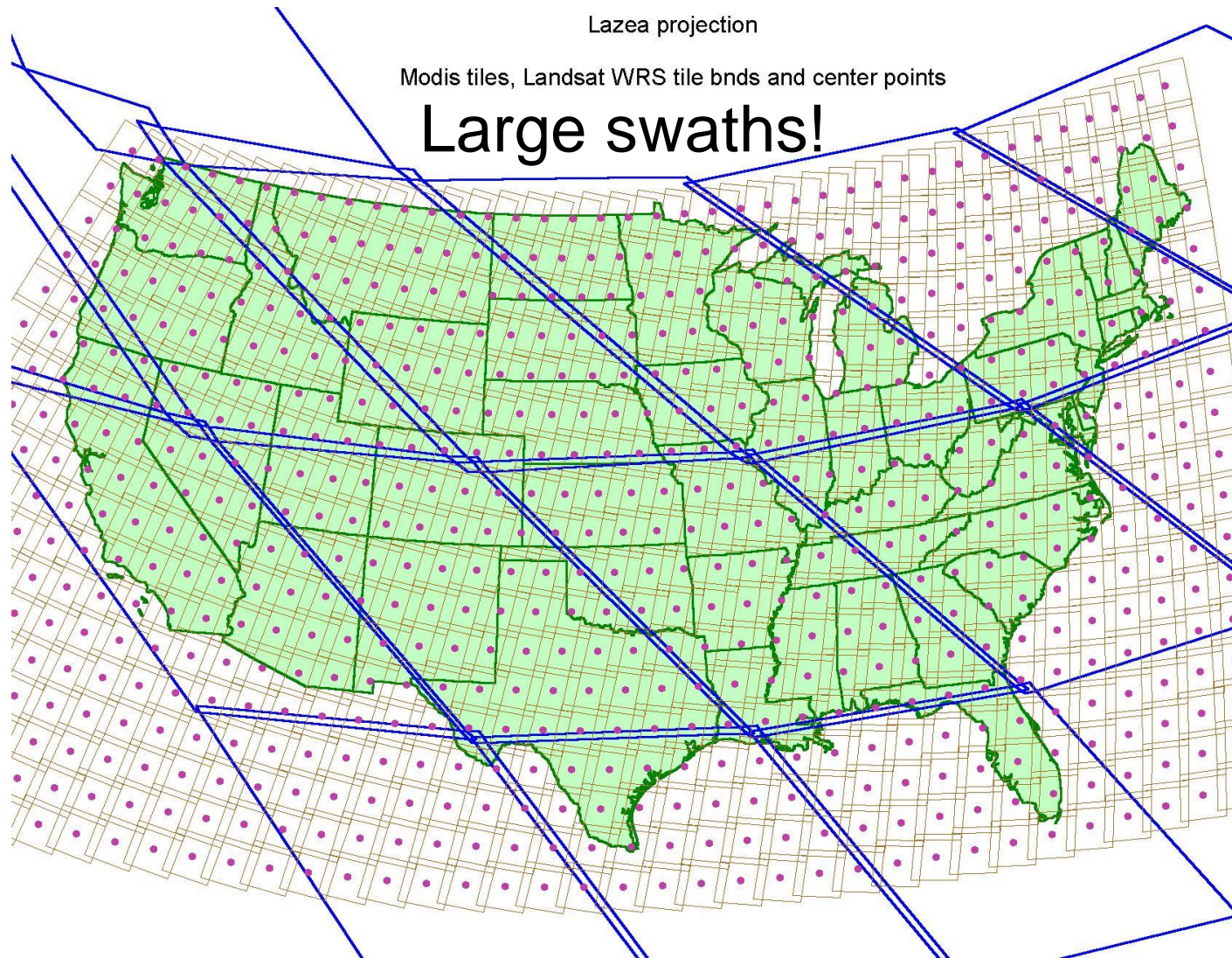
36 bands (major bands include
Red, Blue, IR, NIR, MIR)

Bands 1-2: 250m

Bands 3-7: 500m

Bands 8-36: 1000m

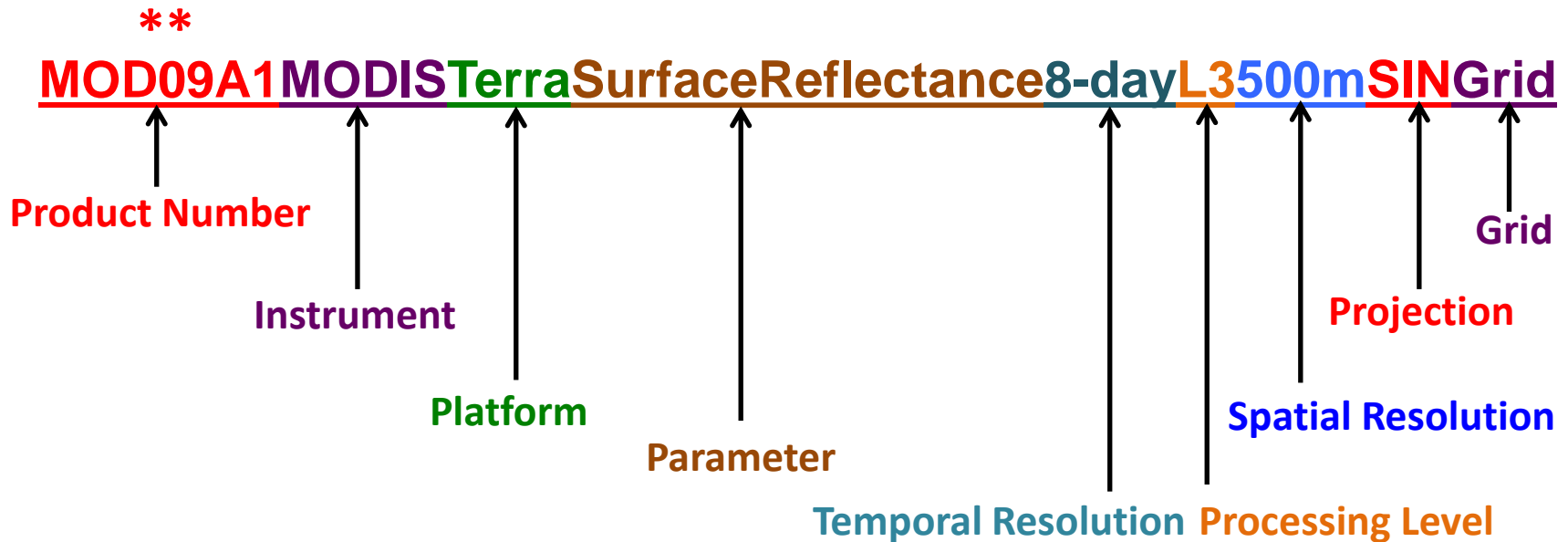
MODIS Land Tiles/Landsat Scenes



MODIS

MODIS's Unique Naming Convention


MODIS filenames follow a naming convention which gives useful information regarding the specific product. For Example:



****NOTE: MOD – Terra; MYD – Aqua; MCD - Combined**

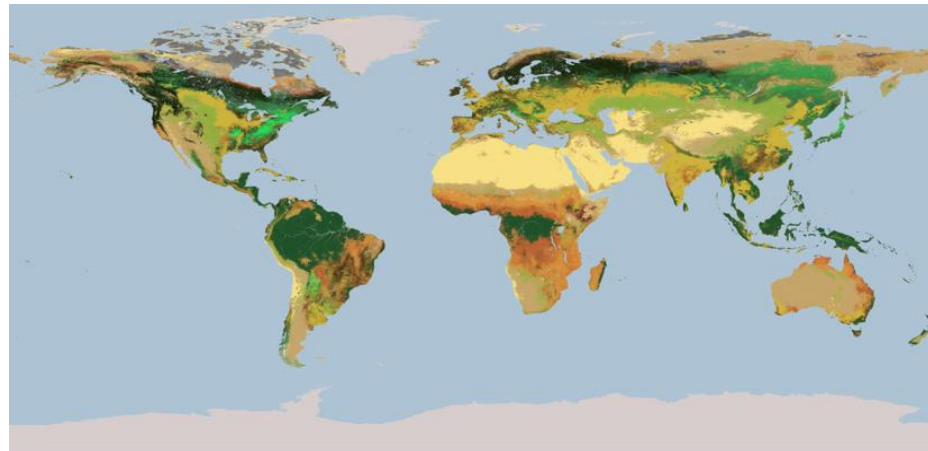
MODIS Land Products

All MODIS Land Products are available at processing Level 3

MODIS Name 	Product Name	Spatial Resolution (m)	Temporal
MOD 09	Surface Reflectance	500	8-day
MOD 11	Land Surface Temperature	1000	Daily, 8-day
MOD 12	Land Cover/Change	500	8-day, Yearly
MOD 13	Vegetation Indices	250-1000	16 day, monthly
MOD 14	Thermal Anomalies/Fire	1000	Daily, 8-day
MOD 15	Leaf Area Index/Fraction of Absorbed Photosynthetically Active Radiation (FPAR)	1000	4-day, 8-day
MOD 16	Evapotranspiration		
MOD 17	Primary Production	1000	8-day, yearly
MOD 43	Bidirectional reflectance distribution function (BRDF)/Albedo	500-1000	16-day
MOD 44	Vegetation Continuous Fields	250	yearly
MOD 45	Burned Area	500	monthly

MODIS Land Products: Land Cover

- Yearly 500 meter product
- Primary Land Cover Type Scheme: International Geosphere Biosphere Program (IGBP) global vegetation classification scheme
 - 11 vegetation classes
 - 3 developed classes
 - 3 non-vegetated classes



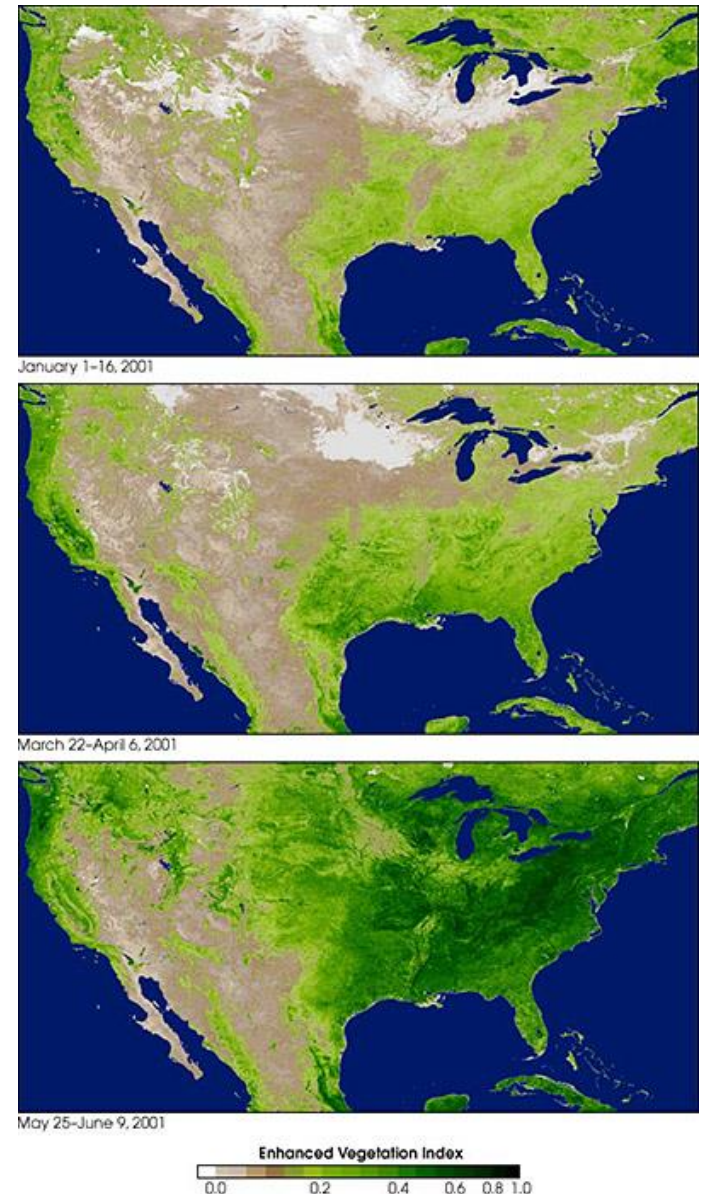
0 Water	6 Closed Shrublands	12 Croplands
1 Evergreen Needleleaf Forest	7 Open Shrublands	13 Urban and Built-Up
2 Evergreen Broadleaf Forest	8 Woody Savannas	14 Cropland/Natural Veg. Mosaic
3 Deciduous Needleleaf Forest	9 Savannas	15 Snow and Ice
4 Deciduous Broadleaf Forest	10 Grasslands	16 Barren or Sparsely Vegetated
5 Mixed Forests	11 Permanent Wetlands	17 Tundra

MODIS Land Products: Vegetation Indices

- **NDVI** (Normalized Difference Vegetation Index): Ratio between the red and the Near-Infrared bands
- **EVI** (Enhanced Vegetation Index): Addition of the blue band to account for atmosphere
- Used for: drought monitoring, phenology (timing of vegetation green-up)

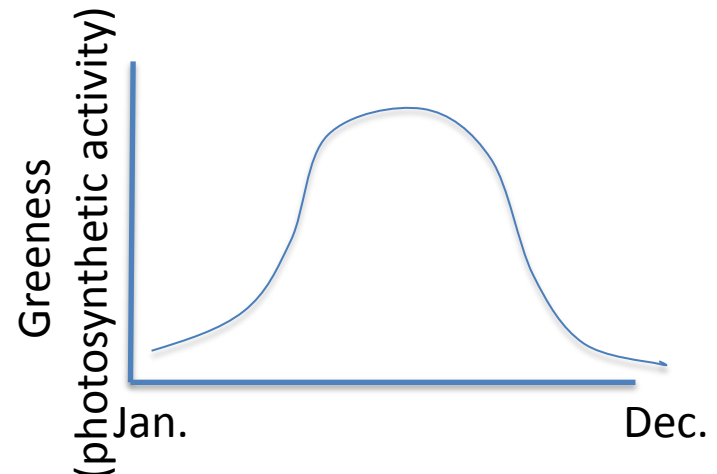
Vegetation index data demonstrates part of the seasonal cycle in the contiguous US during the first half of 2001

Credit: NASA/GSFC/University of Arizona



MODIS Land Products: Land Cover Dynamics (MCD12Q2)

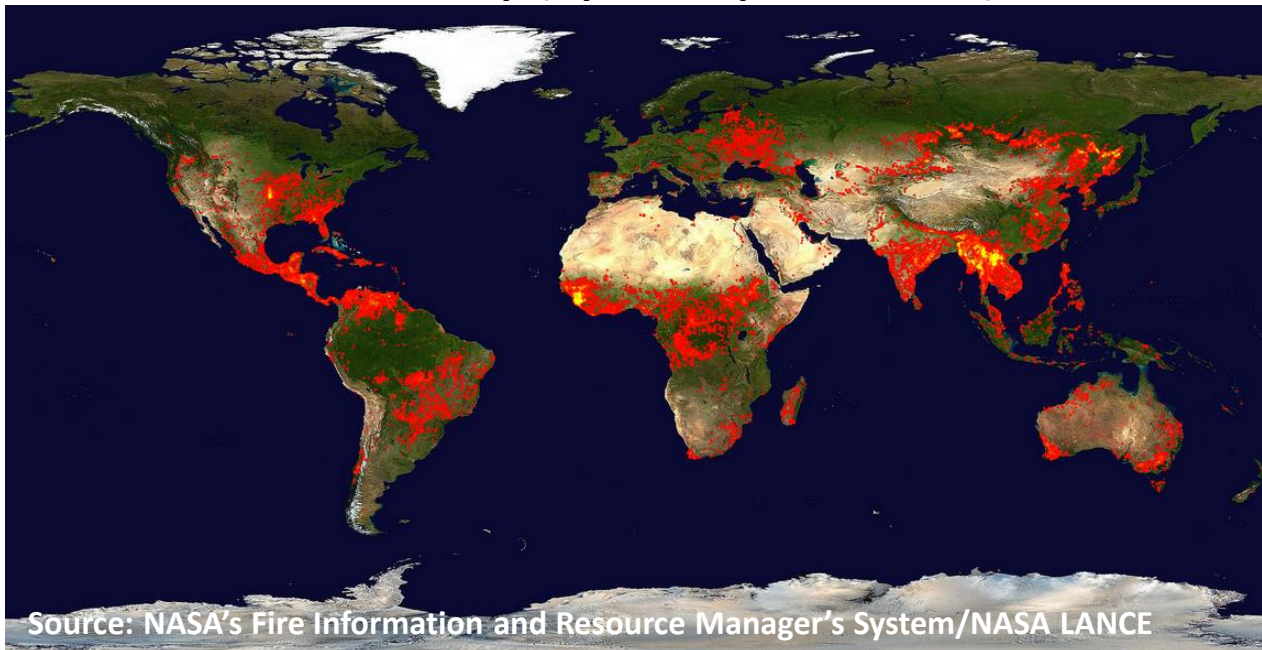
- Informally called the MODIS Global Vegetation Phenology product
- Provides estimates of the timing of vegetation phenology
- Primarily uses MODIS EVI
- Layers correspond to timing of vegetation greenup, maturity, senescence and dormancy:
 - Onset_greenness_increase
 - Onset_greenness_maximum
 - Onset_greenness_decrease
 - Onset_greenness_minimum



MODIS Land Products: Thermal Anomalies

- Provides snapshots of active burning fires and burned areas
- The Active Fire product delivers actively burning locations on a daily basis at 1km resolution (additional 8 day and monthly products)
- Fire product includes multiple attributes such as fire mask, fire pixel table, and maximum fire radiative power
- The Thermal Anomalies product detects other thermal anomalies such as volcanic signatures

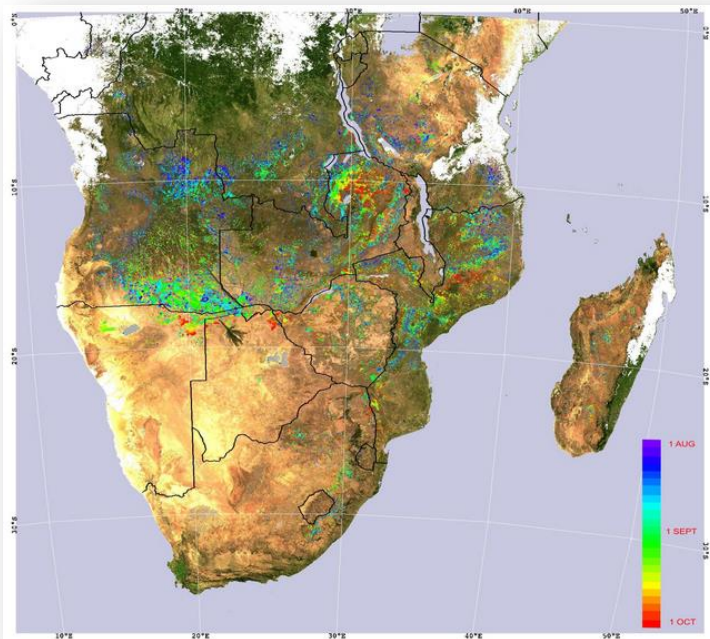
Global Fire Map (April 1- April 10, 2014)



Source: NASA's Fire Information and Resource Manager's System/NASA LANCE

MODIS Land Products: Burned Area

- The combined Terra & Aqua MODIS Burned Area Product is a monthly gridded 500m product
- MODIS detects the approximate date of burning at 500m resolution
- For more information: <http://modis-fire.umd.edu>



Example of the MODIS 500 m burned area product for sub equatorial Africa. The different colors indicate the approximate day of the burning detected between August and October in 2000.

Image courtesy of MODIS Fire Team

Where to Obtain MODIS Products

- **Information on all MODIS Land Products can be found at Land Process DAAC**
https://lpdaac.usgs.gov/products/modis_products_table
- **ECHO Reverb**
<http://reverb.echo.nasa.gov>
- **Data Subsetting and Visualization: Oakridge National Lab DAAC (ORNL DAAC)**
<http://daac.ornl.gov>
- **GLCF**
<http://www.landcover.org/data/lc>
- **GLOVIS**
<http://glovis.usgs.gov>
- **Fire Information for Resource Management System (FIRMS)**
<https://earthdata.nasa.gov/data/near-real-time-data/firms>
- **Visualization: SERVIR**
<https://www.servirglobal.net/Global/MapsData/InteractiveMapper.aspx>

Acquiring MODIS Land Products

<http://reverb.echo.nasa.gov>

The screenshot displays the Reverb | ECHO web interface, titled "The Next Generation Earth Science Discovery Tool". The header includes the NASA logo and "National Aeronautics and Space Administration". The main navigation bar contains links for "EOSDIS Home", "Reverb Home", "About", "Tutorial", "Shopping Cart (0)", "Order Status", "Service Request Status", and "Sign In".

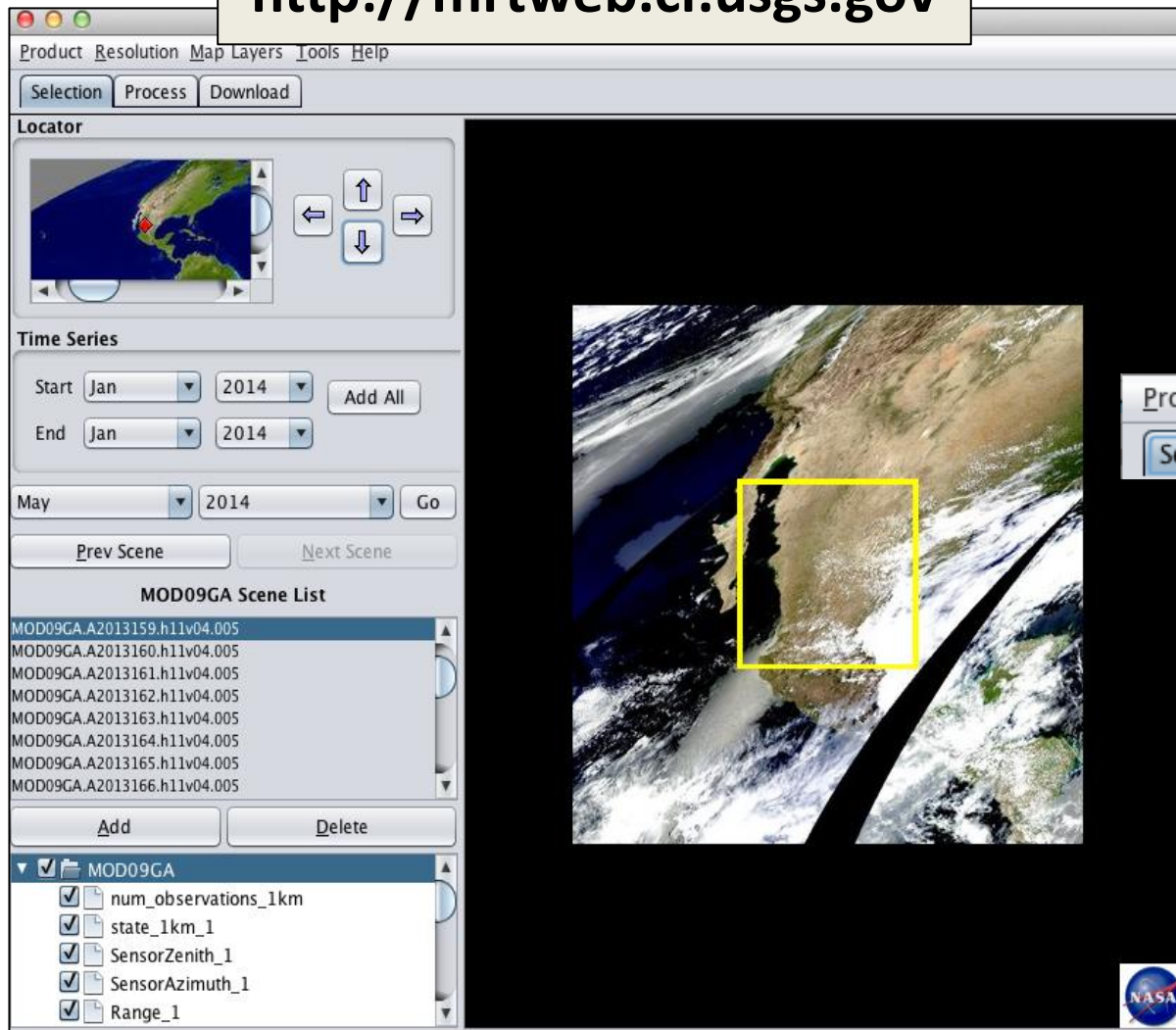
The interface is divided into several sections:

- Search Options:** A sidebar on the left with expandable sections for "Spatial", "Search Terms", "Temporal", "Platforms & Instruments" (listing TERRA and MODIS), "Campaigns", "Processing Levels" (set to 3), and "Science Keywords". It also includes "Save Query" and "Clear Criteria" buttons, a "Feedback?" link, and "Availability" information.
- Step 1: Select Search Criteria:** The main search area, divided into "Spatial Search" and "Search Terms".
 - Spatial Search:** Features a "Bounding Box" input field with a dropdown menu (set to "e.g. -50.736, 163.477, -11.144, 105.680 (S.E.N.W.)"), "Reset", and "Clear" buttons. Below is a satellite map with a "Satellite" dropdown and a "Click and drag to set a bounding rectangle" instruction. A "Search by ESRI shape file" link is also present.
 - Search Terms:** Includes a text input field with "e.g. MODIS Fire AST_L1A" and a "Clear" button.
 - Temporal Search:** Contains "START" and "END" date/time pickers (YYYY-MM-DD HH:MM:SS) with "Clear" buttons. A note states "* all times must be specified in GMT". Below are tabs for "Date Range" and "Annual Repeating Dates".
- Step 2: Select Datasets:** Displays a list of datasets found (85 total, query time 0.75s). The list includes:
 - ☒ Global Fire Emissions Database, Version 2.1 (Archive Center: ORNL_DAAC, Short Name: doi:10.3334/ORNLDAAC/849, Version: 1)
 - ☐ LBA-ECO LC-23 ASTER and MODIS Fire Data Comparison for Brazil: 2003-2004 (Archive Center: ORNL_DAAC, Short Name: doi:10.3334/ORNLDAAC/839, Version: 1)
 - ☐ LBA-ECO LC-23 Characterization of Vegetation Fire Dynamics for Brazil: 2001-2003 (Archive Center: ORNL_DAAC, Short Name: doi:10.3334/ORNLDAAC/843, Version: 1)
 - ☐ MODIS/Aqua NRT value-added Aerosol Optical Depth Product V051 NRT (Archive Center: LAADS, Short Name: MYDAODHD, Version: 5)

May need reprojection: Use MODIS Reprojection Tool

MODIS Reprojection Tool Web Interface (MRTWeb)

<http://mrtweb.cr.usgs.gov>




The MRTWeb has three main tabs: **Selection**
Process
Download

All MODIS tiled data products available except for Land Cover


Acquiring MODIS Land Products: ORNL DAAC

http://http://daac.ornl.gov/cgi-bin/MODIS/GLBVIZ_1_Glb/modis_subset_order_global_col5.pl/



MODIS Global Subsets: Data Subsetting and Visualization

Select Center of Area of Interest
Lat/Lon *OR* Field Site
then Continue



Closest matching address:
Bear Creek Road, Oak Ridge, TN 37830, USA

Enter Signed Decimal Latitude and Longitude of Center Pixel in WGS84 datum
[for example, Walker Branch TN is 35.958767 -84.287433]

Latitude	Longitude
<input type="text" value="35.958767"/>	<input type="text" value="-84.287433"/>

OR

Select the Country to Contain a MODIS Site as the Center Pixel
[Sites within the Selected Country will be Presented in Subsequent Choices]

Algeria

Angola

Antarctica

Argentina

Australia

Austria

Belgium

Benin

Bolivia

Botswana

Acquiring MODIS Land Products : GLCF

Global Land Cover Facility

www.landcover.org

MODIS Land Cover

Global Land Cover Facility (GLCF)

<http://www.landcover.org/data/>

- MODIS products delivered in GeoTIFF format, Albers Equal Area, WGS84
- Product Guides, Data Download Guides, and Technical Guides available

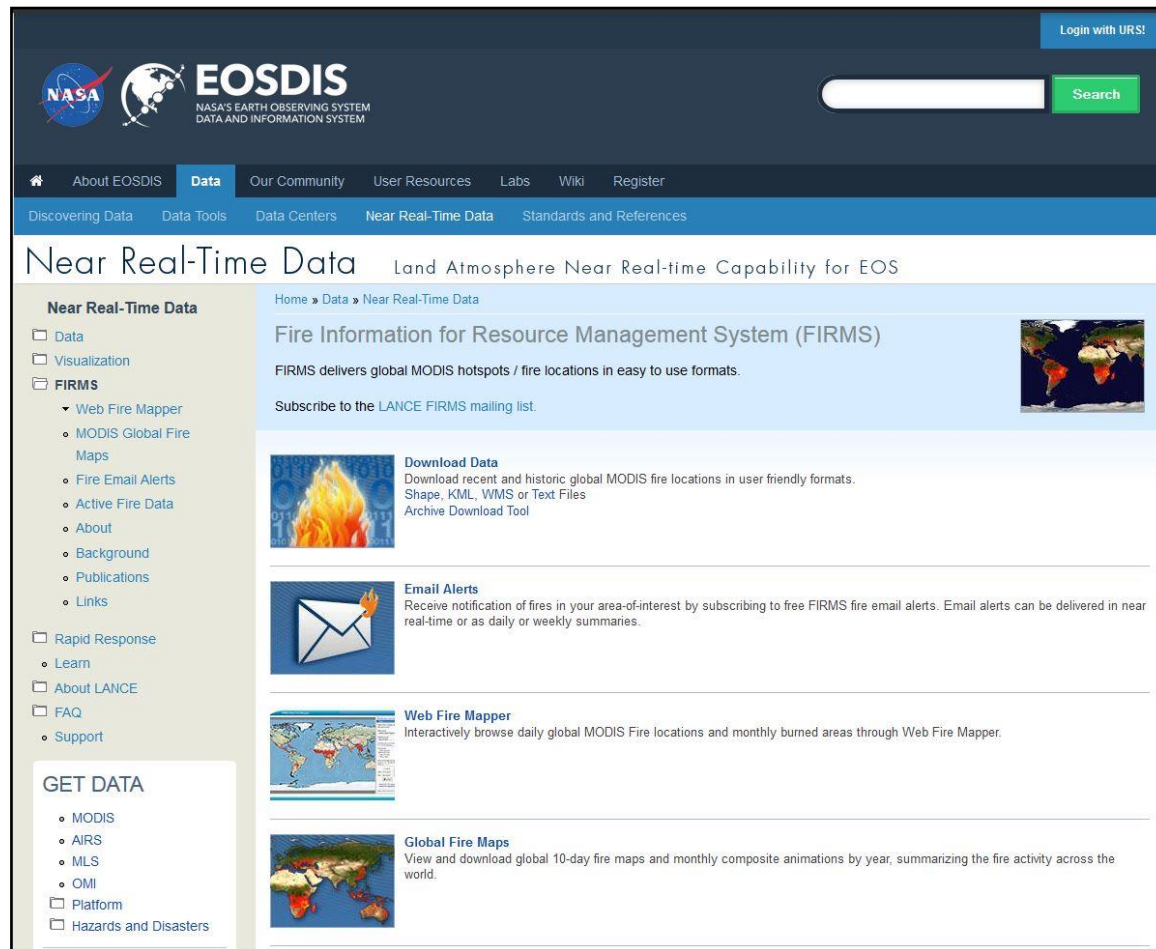


- Albedo
- Broadband Emissivity
- Downward Surface Shortwave Radiation
- Flood Maps
- Land Cover
- Leaf Area Index
- Vegetation Continuous Fields (VCF)
- Vegetative Cover Conversion (VCC)
- Vegetation Index (NDVI)
- Water Mask

Acquiring MODIS Land Products: FIRMS

- MODIS global Fire Maps
- FIRMS delivers global MODIS active fire data and Monthly Burned Area Product in easily downloadable formats.

<https://earthdata.nasa.gov/data/near-real-time-data/firms>



The screenshot shows the NASA EOSDIS website interface. At the top, there's a header with the NASA logo, EOSDIS logo, and a search bar. Below the header is a navigation menu with links like 'About EOSDIS', 'Data', 'Our Community', 'User Resources', 'Labs', 'Wiki', and 'Register'. The 'Data' section is highlighted, and a sub-menu shows 'Discovering Data', 'Data Tools', 'Data Centers', 'Near Real-Time Data', and 'Standards and References'. The main content area is titled 'Near Real-Time Data' and 'Land Atmosphere Near Real-time Capability for EOS'. It features a sidebar on the left with a tree view of categories: 'Data', 'Visualization', 'FIRMS' (expanded), 'Rapid Response', 'About LANCE', 'FAQ', and 'Support'. The 'FIRMS' category is further expanded to show 'Web Fire Mapper', 'MODIS Global Fire Maps', 'Fire Email Alerts', 'Active Fire Data', 'About', 'Background', 'Publications', and 'Links'. The main content area displays the 'Fire Information for Resource Management System (FIRMS)' section, which includes a description of FIRMS, a link to subscribe to the LANCE FIRMS mailing list, and three featured tools: 'Download Data' (with a fire icon), 'Email Alerts' (with an envelope icon), and 'Web Fire Mapper' (with a map icon). Each tool has a brief description of its functionality. At the bottom, there's a 'GET DATA' section with links to 'MODIS', 'AIRS', 'MLS', 'OMI', 'Platform', and 'Hazards and Disasters'.

NASA EOSDIS
NASA'S EARTH OBSERVING SYSTEM
DATA AND INFORMATION SYSTEM

Login with URS!

Search

About EOSDIS **Data** Our Community User Resources Labs Wiki Register

Discovering Data Data Tools Data Centers **Near Real-Time Data** Standards and References

Near Real-Time Data

Land Atmosphere Near Real-time Capability for EOS

Home » Data » Near Real-Time Data

Fire Information for Resource Management System (FIRMS)

FIRMS delivers global MODIS hotspots / fire locations in easy to use formats.

Subscribe to the LANCE FIRMS mailing list.

Download Data
Download recent and historic global MODIS fire locations in user friendly formats.
Shape, KML, WMS or Text Files
Archive Download Tool

Email Alerts
Receive notification of fires in your area-of-interest by subscribing to free FIRMS fire email alerts. Email alerts can be delivered in near real-time or as daily or weekly summaries.

Web Fire Mapper
Interactively browse daily global MODIS Fire locations and monthly burned areas through Web Fire Mapper.

Global Fire Maps
View and download global 10-day fire maps and monthly composite animations by year, summarizing the fire activity across the world.

GET DATA

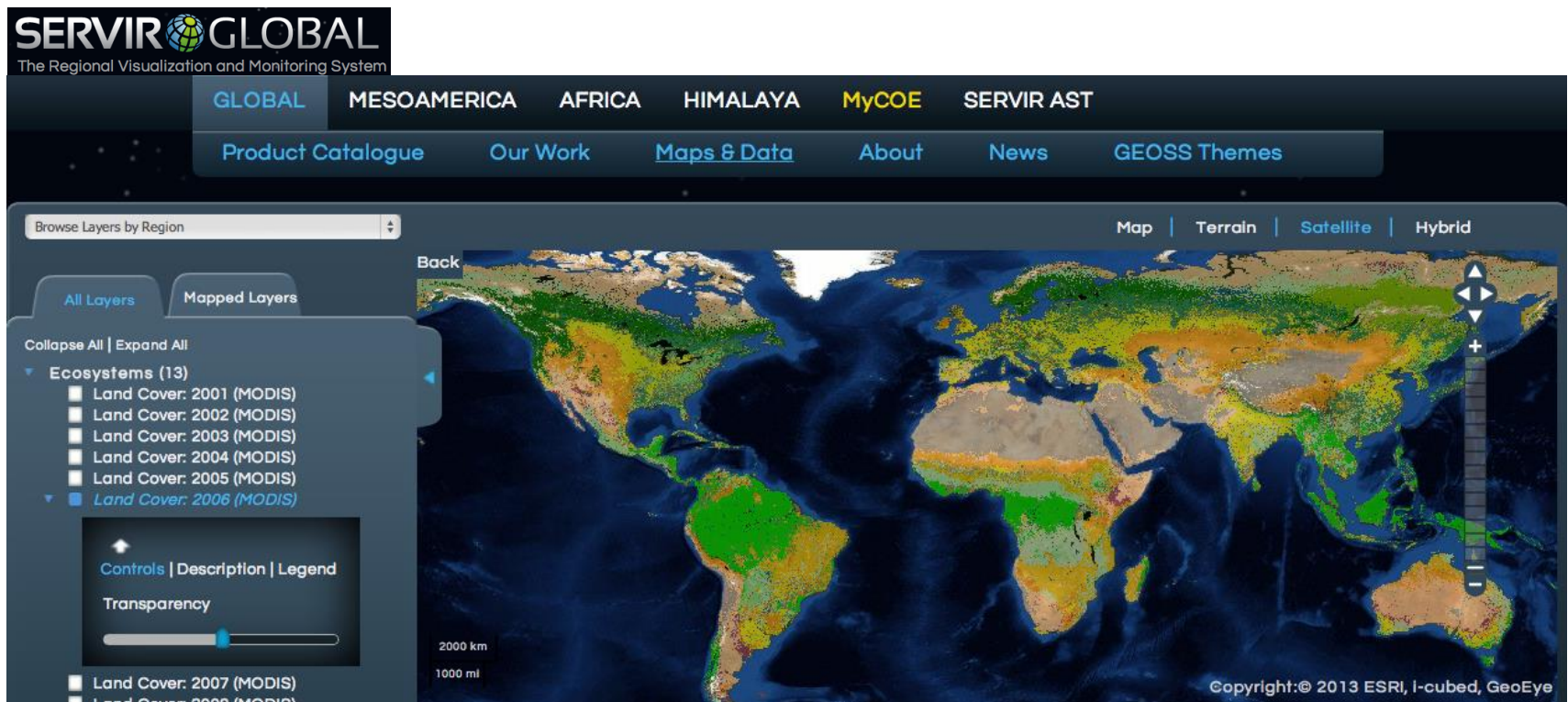
- MODIS
- AIRS
- MLS
- OMI
- Platform
- Hazards and Disasters

Visualizing MODIS Land Products

<https://www.servirglobal.net/Global/MapsData/InteractiveMapper.aspx>

SERVIR - The Regional Visualization and Monitoring System Interactive Mapper

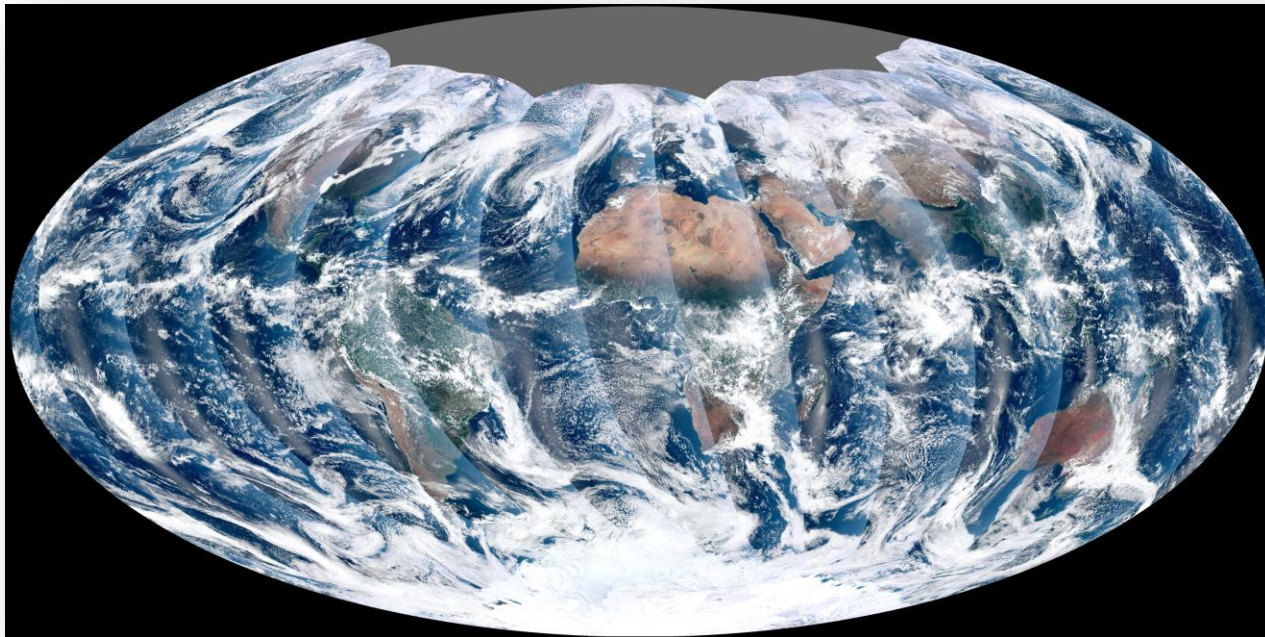
- Allows for visualization and analysis of MODIS Land Products
- Downloading not available through viewer; printing and exporting analysis maps available



Displaying MODIS global Land Cover 2006

VIIRS

Presented by Dr. Jennifer Dungan, NASA Ames Research Center



First global image from VIIRS

Source: earthobservatory.nasa.gov

MODIS/VIIRS Transition

Aqua MODIS



Credit: NASA/Marit Jentoft-Nilsen



Credit: NASA/Reto Stöckli

Suomi NPP VIIRS



Credit: NASA/NOAA/GSFC/Suomi
NPP/VIIRS/Norman Kuring

VIIRS

Visible Infrared Imaging Radiometer Suite

Spatial Resolution

375 km, 750 km

Temporal Resolution

Daily, 8-day, 16-day, monthly, quarterly, yearly (2012-present)

Data Format

Hierarchical Data Format – HDF5

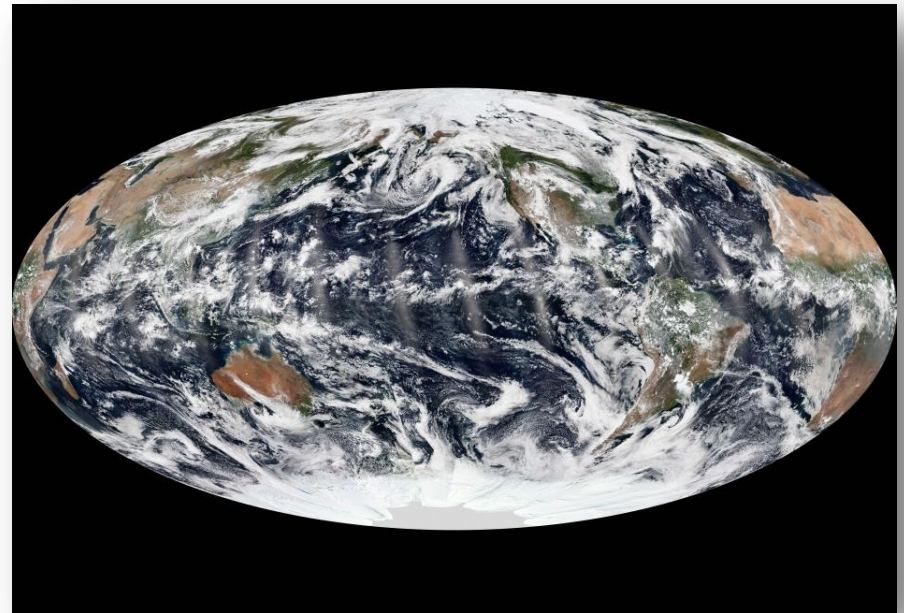
Spectral Coverage

22 bands (major bands include Red, Blue, IR, NIR, MIR)

“I” Bands: 375m

“M” Bands: 750m

Day-night band: 800m



VIIRS/MODIS Corresponding Spectral Bands

VIIRS Band	Spectral Range (μm)	Nadir HSR (m)	MODIS Band(s)	Spectral Range (μm)	Nadir HSR (m)
DNB	0.500 – 0.900				
M1	0.402 – 0.422	750	8	0.405 – 0.420	1000
M2	0.436 – 0.454	750	9	0.438 – 0.448	1000
M3	0.478 – 0.498	750	3 10	0.459 – 0.479 0.483 – 0.493	500 10000
M4	0.545 – 0.565	750	4 12	0.545 – 0.565 0.546 – 0.556	500 1000
I1	0.600 – 0.680	375	1	0.620 – 0.670	250
M5	0.662 – 0.682	750	13 14	0.662 – 0.672 0.673 – 0.683	1000 1000
M6	0.739 – 0.754	750	15	0.743 – 0.753	1000
I2	0.846 – 0.885	375	2	0.841 – 0.876	250
M7	0.846 – 0.885	750	16 2	0.862 – 0.877 0.841 – 0.876	1000 250
M8	1.230 – 1.250	750	5	SAME	500
M9	1.371 – 1.386	750	26	1.360 – 1.390	1000
I3	1.580 – 1.640	375	6	1.628 – 1.652	500
M10	1.580 – 1.640	750	6	1.628 – 1.652	500
M11	2.225 – 2.275	750	7	2.105 – 2.155	500
I4	3.550 – 3.930	375	20	3.660 – 3.840	1000
M12	3.660 – 3.840	750	20	SAME	1000
M13	3.973 – 4.128	750	21 22	3.929 – 3.989 3.929 – 3.989	1000 1000
M14	8.400 – 8.700	750	29	SAME	1000
M15	10.263 -- 11.263	750	31	10.780 – 11.280	1000
I5	10.500 – 12.400	375	31 32	10.780 – 11.280 11.770 – 12.270	1000 1000
M16	11.538 – 12.488	750	32	11.770 – 12.270	1000

MODIS-VIIRS Transition Issues

Spectral characteristics:

MODIS and VIIRS bands used for land products have similar but not identical spectral characteristics

Tungsten oxide contamination in VIIRS bands I2 and M7

Spatial characteristics:

VIIRS has Improved spatial resolution at swath edge

VIIRS 375m vs. MODIS 250m resolution for vis/NIR bands

Algorithms:

Different sets of standard products (no TOC NDVI EDR)

Algorithm changes from MODIS to VIIRS for some standard products

Different cloud and aerosol filtering

Different compositing periods

MODAPS vs. IDPS

Differences in gridding

Reprocessing not available from IDPS

Data distribution:

MODIS data pools vs. NOAA CLASS


MODIS products in HDF4, VIIRS products in HDF5

VIIRS Land Products

- Called “Environmental Data Records” by NOAA
- Include:
 - Active fires
 - Albedo (surface)
 - Land Surface Temperature
 - Surface type (not yet produced)
 - Vegetation index (Top-of-Canopy Enhanced Vegetation Index and Top-of-Atmosphere Normalized Difference Vegetation Index)

Acquiring VIIRS Land Products

<http://www.class.ncdc.noaa.gov/>

**NOAA**
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

COMPREHENSIVE LARGE ARRAY-DATA
STEWARDSHIP SYSTEM (CLASS)
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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- Advanced Options**
 - [» Download Keys](#)
 - [» Release Info](#)
 - [» Version 6.3.3](#)

Please select a product to search [»GO](#)

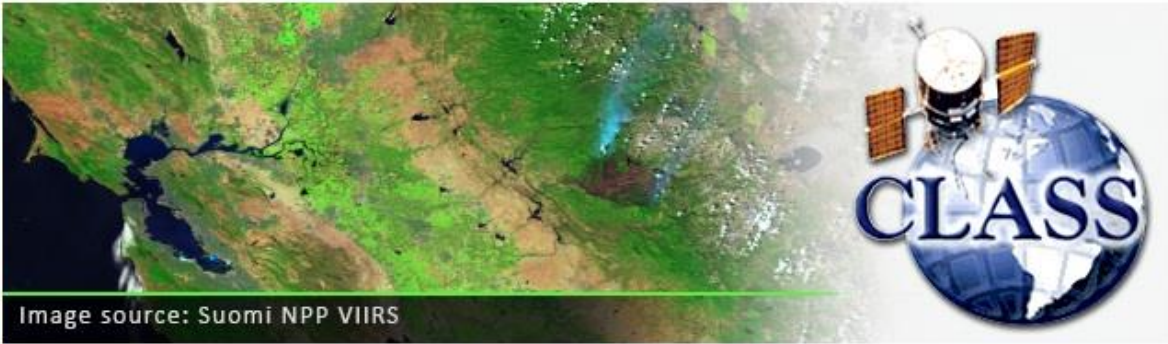


Image source: Suomi NPP VIIRS

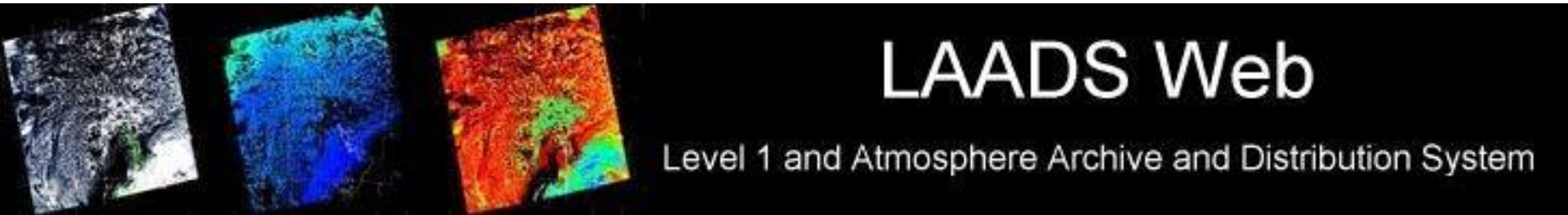
NEWS

Attention Suomi NPP Users:
The most recent global NPP operational products are now available in daily tar files for quick and easy downloads at: <ftp://ftp-npp.class.ngdc.noaa.gov/>. Please see the [NPP help page](#) for instructions. Up to the most recent 85 days of data will be available for direct online access.

SEARCH FOR DATA

- ☐ Environmental Data from Polar-orbiting Satellites
- ☐ Environmental Data from Geostationary Satellites
- ☐ Defense Meteorological Satellite Program (DMSP)
- ☐ Suomi National Polar-orbiting Partnership (NPP)
- ☐ Sea Surface Temperature data (SST)
- ☐ RADARSAT
- ☐ Altimetry / Sea Surface Height Data (JASON-2)

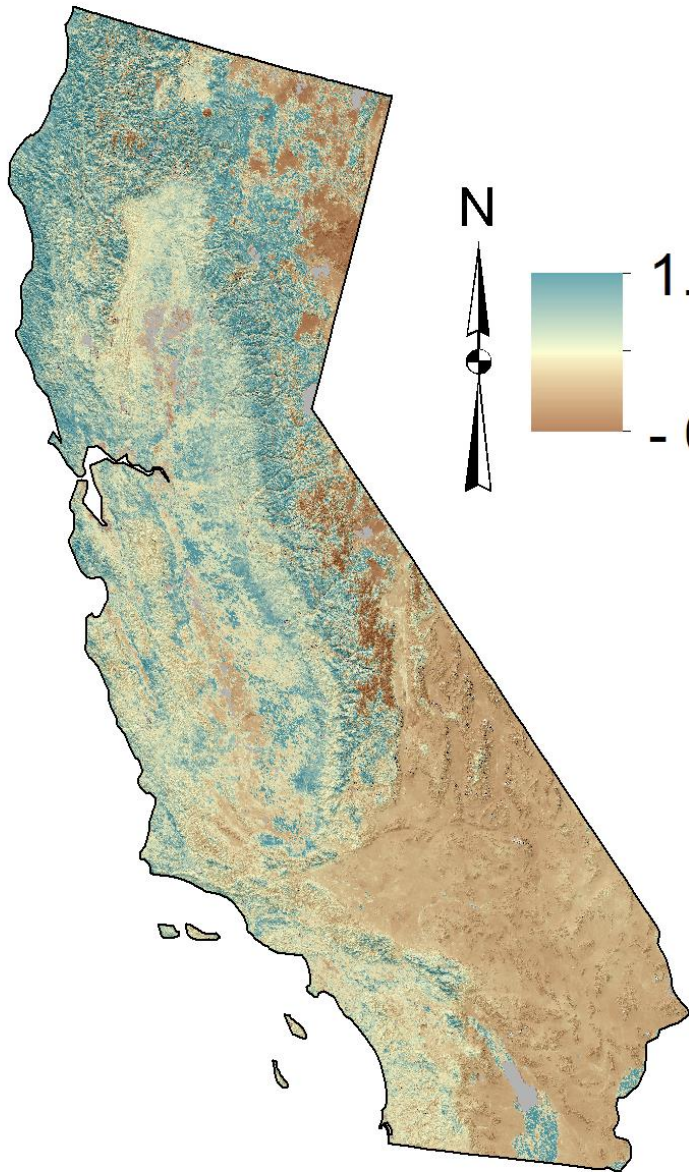
Acquiring VIIRS Land Products



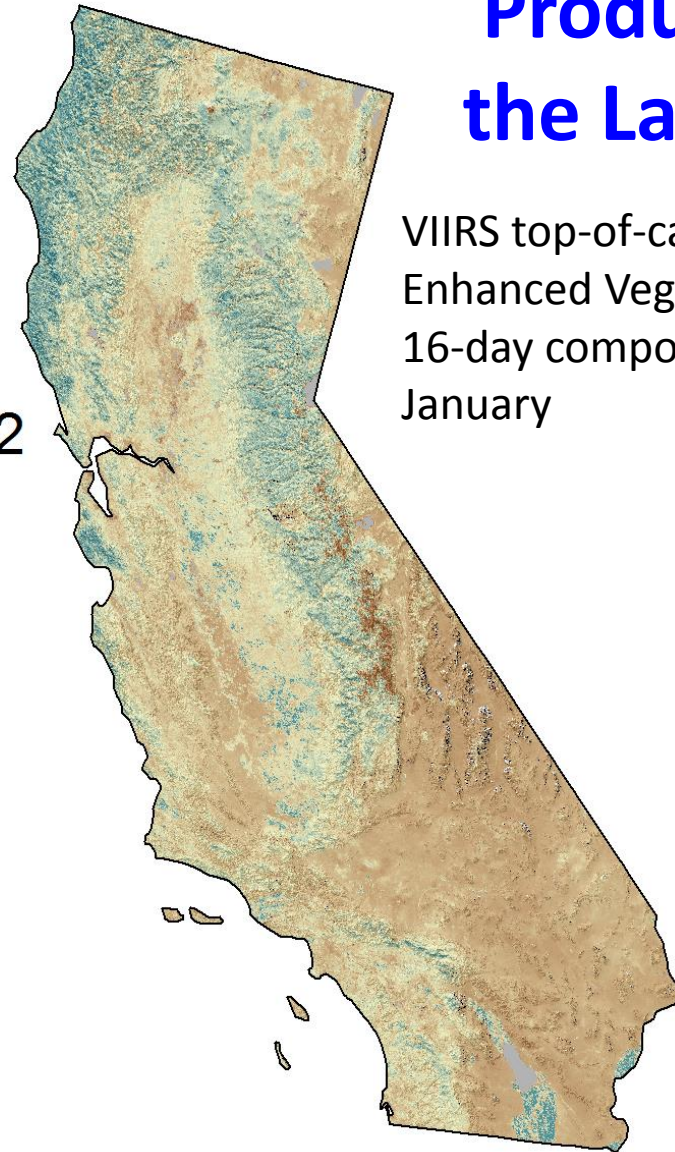
www.ladsweb.nascom.nasa.gov/data/search.html

- Includes VIIRS products generated by NASA
- Select “Level 3 tiled products” from Collection 1.1 for the most current products as of May, 2014

2013



2014



1.0

- 0.2

Gridded VIIRS Products from the Land PEATE

VIIRS top-of-canopy “adjusted”
Enhanced Vegetation Index (EVI),
16-day composite, first 2 weeks in
January

Coming up next week!

Week 3 (3 June 2014)

**Soil Moisture and
Evapotranspiration**

In the coming weeks, please feel free to suggest specific demonstrations of portals or use of data that you might be interested in for WEEK 5.

Thank You!

Cindy Schmidt
Cynthia.L.Schmidt@nasa.gov